

LABORATORY BEST MANAGEMENT PRACTICES

FOR

The City of Bozeman Water Treatment Plant



Revised 03/15/16

In accordance with OSHA Standard 29 CFR 1910.1450 and the Montana Safety Culture Act and requirements set forth by the MT DEQ in Groundwater Discharge Permit MTX000224.

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Section I

Chemical Hygiene Plan

The general intent of the chemical hygiene plan for the City of Bozeman Water Treatment Plant is:

- 1) To protect laboratory employees from health hazards associated with the use of hazardous chemicals in our laboratory.
- 2) To minimize employee exposure to all chemicals and to assure that our laboratory employees are not exposed to substances in excess of the permissible exposure limits as defined by OSHA in 29 CFR 1910 part Z.

The plan will be available to all employees for review at all times and copies will be located in the Chemical Hygiene Plan binder in the in the Water Treatment Plant control room and Laboratory.

This plan will be reviewed annually by the Chemical Hygiene Officer and updated as necessary. The WTP Lab and Compliance Coordinator and Operations Foreman are designated as the Chemical Hygiene Officers.

I. Standard Operating Procedures to be followed in the lab relevant to safety and health when using chemicals:

A. Accidents and Spills.

1. Promptly clean up any spills or broken glassware using puncture proof gloves with liners, goggles, and other appropriate protective apparel and equipment using proper disposal procedures.
2. In case of accidental ingestion, immediately consult the SDS for proper first aid procedures and seek medical attention.
3. In case of accidental eye contact, promptly flush eyes with water for 15 minutes and seek medical attention.
4. In case of accidental skin contact, flush the affected area with water and remove contaminated clothing. Consult SDS as per procedures and seek medical attention if symptoms persist.
5. Do not neglect any accident no matter how insignificant, and report all accidents to the lab supervisor.
6. Spilled blood should be cleaned up and the area disinfected by lab employees or Lab Coordinator utilizing a 10% bleach and water solution.

Saturated towels shall be packaged in biohazard bags and safety officer contacted. DO NOT dispose of medical waste in trash can.

7. Section II and SDS include specific procedures for the proper handling of spills.

B. Avoidance of routine exposure

1. Develop and encourage safe habits and avoid unnecessary exposure by any route.
2. Do not smell or taste chemicals.
3. Use fume hood when release of any toxic fume may occur.
4. Do not use mouth suction for pipetting or starting a siphon.
5. Do not use any chemicals which have no label or have been improperly labeled or for which no SDS is available.
6. Wash your hands periodically through the day, especially after contact with any chemical or before eating. Wash with soap and running water, with hands held downward to flush the contamination off the hands. Turn the tap off with a clean paper towel to prevent recontamination, and dry your hands with clean towels.
7. Only use chemicals for which the quality of available ventilation is available and only for applications they are appropriate for.
8. Be aware of and follow all standard operating procedures.

C. Eating, Drinking, Smoking, etc.

1. Avoid eating, drinking, smoking, chewing gum, or applying cosmetics in areas where laboratory chemicals are present.
2. Refrigerators, glassware, and utensils used for laboratory operations are never to be used for food storage, preparation, or consumption.
3. Always wash hands before eating, drinking, or applying cosmetics after working in the laboratory.

D. Equipment and Glassware

1. Handle and store all laboratory equipment and glassware with care to prevent damage. Use extra care with volumetric flasks.

2. Use equipment only for its assigned purpose.
3. Clean all equipment after use and return to its designated storage area.
4. Discard and chipped or cracked glassware in designated disposal container.
5. Never use damaged or imperfect equipment.

E. Leaving the Laboratory

1. Wash your hands before leaving the lab when taking breaks and at the end of your shift.
2. Always leave the lab neat and clean.
3. Do not take laboratory coats or other PPE home for any reason.

F. Horseplay

1. Avoid practical jokes, or other types of behavior when working in the laboratory.

G. Personal Apparel

1. Wear appropriate eye protection at all times when working with chemicals. This may include goggles for any operation not performed under the hood.
2. Wear a lab coat at all times when in the lab area.
3. Confine long hair and loose clothing.
4. Wear closed-toed shoes or boots at all times, sandals or perforated shoes are unacceptable.

H. Personal Housekeeping

1. Keep work area and floors clean and uncluttered.
2. Return all chemicals and equipment to the designated storage area immediately after use.
3. Chemical containers are to be clean, labeled, and dry when returned to storage after use.

4. Access to exits, emergency equipment, fire extinguishers, eyewash stations, showers, and electrical controls must never be blocked.

I. Personal Protection

1. Always wear goggles with splash protection when working with acids or other hazardous liquids. Consult SDS if status of chemical is unclear.
2. Wear chemical resistant gloves when handling any chemicals, inspect their quality before use, and wash before removing from hands.
3. Wear thermal resistant gloves when operations involve the handling of heated material or exothermic reaction vessels.
4. Remove lab coat immediately upon significant contamination. Place the coat in a bag and affix a label describing the chemical and keep it separate from other laundry. Label must contain "CAUTION—HAZARDOUS CHEMICAL".
5. If wearing contact lenses in the lab, inform the supervisor and take appropriate measures to further protect eyes.
6. Be familiar with location and proper use of safety showers, eye wash stations, first aid kits, fire extinguishers, and exits in case of emergency.
7. Watch out for trip hazards.
8. Use adequate lighting for all lab work.
9. All employees shall remain vigilant for unsafe practices, conditions, and encourage safe work practices by coworkers. Any laboratory hazards shall be reported to the Lab Coordinator for immediate correction.

J. Planning

1. Plan appropriate procedures and positioning of equipment before beginning any operation.
2. Refer to SDS for information on any unfamiliar chemical to be used.
3. Be familiar with the symptoms of exposure when working with chemicals and follow all the necessary precautions to prevent exposure.
4. Seek advice if unsure about anything.

K. Unattended Operations

1. Try to avoid leaving lab operations unattended.
2. Leave lights on and place an appropriate sign to indicate operation is in progress and unattended.
3. Provide for contaminant containment in the event of failure.
4. Do not leave any chemical filling operations unattended at any time.

L. Use of Hood

1. Use hood for all operations that could result in strong fume production. Acid and Base Solution preparation and any operation involving volatiles are to be performed in the hood.
2. Do not store any chemicals or unnecessary materials in the hood.
3. Do not work with flames and any flammable chemical under the hood at the same time.
4. Leave hood on when hazardous chemicals are contained within it or if uncertain whether lab will remain adequately ventilated if turned off.
5. The hood is not to be used as a means of disposal for volatile chemicals.
6. Confirm adequate ventilation and inward flow of air by observing the hood flow indicator strip movement at the top of the hood.

M. Waste Disposal and Storage

1. Refer to SDS before disposing of any chemicals.
2. Dispose of chemical waste as referred to in **Section II**.
3. Do not discharge to the septic tank any concentrated acids, bases, or highly toxic substances which might interfere with the biological activity of the septic tank, create fire or explosion hazards, cause structural damage, or obstruct flow.
4. See **Section II Waste Disposal and Spill Program** for specific procedures.

N. Working Alone

1. Do not work alone in the laboratory if the operations to be done are hazardous or require the fume hood.

O. Chemical Storage

1. All chemicals shall be labeled with the date received and date opened.
2. All reagents made in the laboratory shall be labeled with the following information: date prepared, contents, concentration, preparer's name, intended use, PPE, and target organs.
3. Store chemicals according to class in areas protected from heat and direct sunlight.
 - a. Store acids and bases separately in assigned area away from volatile organics and oxidizable chemicals.
 - b. Place acid-resistant trays under bottles of acids.
4. Store chemicals at or below eye level in a well-illuminated storage area.
5. All labels should face forward.
6. Make sure all lids are tightly fastened to prevent escape of fumes and avoid potential spills.
7. Examine stored chemicals frequently for replacement, deterioration, corrosion, container integrity, and expiration dates.
8. All secondary containers that will not be depleted during one shift must be properly labeled-preferably from the original container (photocopy).

P. Safe Handling of Chemicals

1. Consider all laboratory chemicals hazardous.
2. Use rubber or plastic transport buckets to transport acids or bases.
3. Work with strong acids, bases, inorganic salts and metals, and volatile flammables under the fume hood.
4. Use heat and chemical resistant plastic trays to catch spill when preparing solutions of acids and bases.

5. ALWAYS refer to the SDS in order to determine the appropriate personal protective equipment while handling any chemical.

II. Control Measures to Reduce Employee Exposure to Hazardous Chemicals

- A. The following operations will be performed in the Fume Hood:
 - 1. Preparing Strong Acid or Base Solutions.
 - 2. Operations involving Volatile Solutions.
- B. There will be no operations that require a biological safety cabinet or a glove box in our laboratory.
- C. Respirators will be used in accordance with the respiratory protection policy of the City of Bozeman Water Treatment Plant, and with the OSHA respirator standard 29 CFR 1910.134.
- D. Appropriate protective apparel compatible with the required degree of protection for substances handled will be used as dictated by the SDS for each chemical. The City of Bozeman Water Treatment Plant will advise employees on glove, gown, eye protection, barrier creams, and etc use. Permeability charts are available from the CHO.
- E. Employees will be instructed on the location and use of eye wash stations and safety showers. The Chemical Hygiene Officer is responsible for this instruction.
- F. Employees will be trained during the safety orientation on the use of fire extinguishers and other fire protection systems. Refresher training will be provided during the course of the year.

III. Maintenance of Safety Showers, Eyewash Stations, Fume Hood, and Other Protective Equipment

- A. Fume Hood will be inspected every month by lab personnel and any inadequacy of face velocity will be verified by direct testing; reports of hood inspections are recorded for employee review in the "Fume Hood Maintenance Book" which is kept in the lab. If face velocity is determined to be inadequate, immediate repairs will be arranged.
- B. Safety Showers/Eyewash Stations will be inspected every month by an assigned employee to assure there is adequate flow and pressure. Reports of the safety shower/eyewash station inspections will be kept on record in the JobCal maintenance program.

- D. Fire Extinguishers will be inspected every month by an assigned employee to assure the pressure is adequate and the canister is in good condition and easily accessible. Reports of fire extinguisher inspections will be kept on record in the JobCal maintenance program.

IV. Employee Information and Training

- A. Each employee covered by the laboratory standard will be provided with information and training so that they are apprised of the hazards of chemicals present in their work area. This training will be given at the time of initial assignment and prior to new assignments involving different exposure situations. Refresher training will be given annually through the review of the SOPs, Best Management Practices, Emergency Response Plans, and Chemical Hygiene Plans.
- B. The training/information sessions will include the following:
 - 1. The contents of Standard 29 CFR 1910.1450 *Occupational Exposure to Hazardous Chemicals in Laboratories* in **Section V** of the Best Management Practices Plan. This will be available to employees at the City of Bozeman Water Treatment Plant in the laboratory.
 - 2. The Chemical Hygiene Plan will be available to City of Bozeman Water Treatment Plant employees in the Laboratory and in the WTP Control Room.
 - 3. Permissible exposure limits (PELs) are defined as the allowable level of exposure to a chemical over an 8 hour work day, 5 days per week. PELs for all laboratory chemicals can be located in the corresponding SDS in the City of Bozeman Water Treatment Plant Laboratory.
 - 4. Any signs or symptoms which occur in the workplace and may be a result of exposure to a hazardous chemical should be reported to a supervisor immediately for evaluation and possible medical attention.
 - 5. SDS for all laboratory chemicals, reference materials, and safe handling of chemicals in laboratories will be available to all employees and are located in the City of Bozeman Water Treatment Plant Laboratory.
 - 6. Measures to protect employees from hazards, including:
 - a. Standard Operating Procedures
 - b. Work practices
 - c. Emergency Procedures

- d. Personal protective equipment
 - e. Details of the Chemical Hygiene Plan
- C. The training sessions will be conducted by the Chemical Hygiene Officer and will consist of lectures, videos, handouts, and demonstrations. An outline of the training program is in Appendix B. (1910.1450) CFR. There will also be an annual review of the Chemical Hygiene Plan.
- D. Each employee will sign a form documenting the components of the training and that they received the training. Employees will also sign the work order that is printed out from JobCal documenting that they have reviewed the Chemical Hygiene Plan. Employee observations will also take place when they are working with chemicals in the laboratory to gauge their understanding of the Chemical Hygiene Plan.
- E. The Chemical Hygiene Officers are responsible for the development of standard operating procedures and are responsible for the portion of the training on standard operating procedures.

V. Prior Approval for Specific Laboratory Operations

The City of Bozeman Water Treatment Plant Laboratory has only one chemical, at this time, which is sufficiently hazardous to require prior notification/approval before being used. In addition, the lab does not use substances for which OSHA has medical monitoring requirements.

VI. Medical Consultation and Examination

The City of Bozeman Water Treatment Plant, through Bozeman Deaconess Hospital, shall provide, to affected employees, medical attention including follow up examinations which Workman's compensation determines are necessary under the following circumstances:

- A. Whenever an employee develops signs and symptoms associated with a hazardous chemical to which they may have been exposed, the employee will be provided an opportunity to receive appropriate medical attention. The employee will contact the Chemical Hygiene Officer to initiate the medical program.
- B. 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, the affected employee, laboratory or custodial, will be provided an opportunity for a medical consultation. This consultation is for the purpose of determining the need for a medical examination.

- C. All medical examinations and consultations are provided by Bozeman Deaconess Hospital. All aspects of these examinations are provided by a licensed physician, or supervised by a licensed physician. These examinations are provided without cost to the employee, without loss of pay, and at a reasonable time and place.
- D. The Chemical Hygiene Officers will provide the following information to the physician:
 - 1. Identity of the hazardous chemical to which the employee may have been exposed including appropriate SDS sheets.
 - 2. A description of the conditions of the exposure including exposure date if available.
 - 3. A description of signs and symptoms of exposure that the employee is experiencing (if any).
- E. The written opinion that the City receives from the physician will include:
 - 1. Recommendations for future medical follow up.
 - 2. Results of examination and associated tests.
 - 3. Any medical condition revealed which may place the employee at increased risk as the result of a chemical exposure.
 - 4. A statement that the employee has been informed by the physician of the results of the examination/consultation and told of any medical conditions that may require additional examination or treatment.
 - 5. A return to work authorization from the physician.
- F. The material returned to the City of Bozeman Water Treatment Plant by the physician will not include specific findings and diagnosis which are unrelated to occupational exposure.

VII. Responsibilities under the Chemical Hygiene Plan

The Laboratory Coordinator is designated a Chemical Hygiene Officer for the City of Bozeman Water Treatment Plant. The following duties and responsibilities will be administered by the Chemical Hygiene Officer:

- A. Development and implementation of appropriate chemical hygiene policies and practices.
- B. Maintaining appropriate audits bi-annually.

- C. Seeking ways to improve the chemical hygiene program, including asking for employee input.
- D. Annual review and revision of the Chemical Hygiene Plan with affected employees.

VIII. Emergency Response

The City of Bozeman Water Treatment Plant Emergency Response Plan is contained in a binder in the Control Room. It contains plans for several potential plant wide emergencies and how to respond to them. All employees are required to review to at start of employment and annually thereafter. We also have on staff a certified HAZWOPER.

Section II

Waste Disposal and Spill Response Program

All substances must be disposed of in a safe and acceptable manner to avoid harm the people and the environment. Always refer to the SDS before disposing of any chemical or before cleaning any spill.

All substances prohibited from going into the septic system must be disposed of in the laboratory disposal sink which drains into a holding tank in the vehicle maintenance area. For a list of prohibited substances, see the CHO, the end of this section, or the list posted above the laboratory sink.

- I. Disposal to the Septic System
 - A. Only water soluble substances should be disposed of in the laboratory sink.
 - B. Flammable solvent solutions must be diluted as to not pose a fire hazard.
 - C. Acids and bases should never be disposed of into the septic system.
 - D. Highly toxic or malodorous chemicals should not be disposed of down the drain.

- II. General Procedure for Handling Spills
 - A. Attend to any persons who may have been contaminated.
 - B. Notify persons in the immediate area about the spill.
 - C. If the spilled material is flammable, turn off any heat sources.
 - D. Try to confine the spill to a small area; do not allow it to spread.
 - E. Minimum protective equipment should include: goggles, lab coat, and chemical resistant gloves. Do not allow spilled chemicals to come into contact with skin or eyes! Goggles are readily available in the laboratory for all employees working in the lab.
 - F. Refer to the SDS before cleaning up the spill for proper procedures and precautions.
 - G. A spill kit is available in the lab and must be replenished after each and every use.

- III. Procedures for Waste Disposal and Spill Cleanup
 - A. Acid solutions

Small acid spills must be neutralized with soda ash then flushed down the disposal sink followed by flushing with adequate volumes of water.

B. Basic solutions

Small basic solution spills must be neutralized with hydrochloric acid and flushed down the disposal sink followed by adequate volumes of water.

Basic solution spills make the surface area slippery and may require washing with soap and water.

C. Inorganic salts

Solids should be collected in a beaker and dissolved in a large amount of water.

Add soda ash, mix, then neutralize with vinegar and flush down the disposal drain with adequate volumes of water.

D. Volatile solvents

If minor quantities are spilled, wipe up with paper towels and discard into a proper waste receptacle. Spilled solids of low toxicity can be swept into a dustpan and placed in a solid waste container.

IV. Sample Disposal

A. Unpreserved water and wastewater (discharge) samples are to be poured into the laboratory sinks while running water from the faucet.

B. Samples that have been preserved or have had reagents added are to be collected in a large beaker along with the volume of the first rinse water. This will be neutralized before being poured down the disposal sink while running water continuously. Samples to be included are Fluoride, Chlorine, hardness, alkalinity, sodium, manganese, and aluminum tests. In addition all pH standards will be collected in a large beaker to be neutralized and disposed of down the disposal sink while running water.

C. Consult the CHOs before discarding any samples that are of unknown composition or not considered routine.

**Can NOT go into Septic System
Any Sample With A Reagent In It.**

OR

Ammonium chloride

Ammonium hydroxide

Buffer powder pillows (7 and 10 pH standards)

pH Standards (4, 7, 10 pH)

EDTA- Ethylenediamine-tetraacetic acid

Ferrous ammonium sulfate

Hydrochloric acid

Rover rust remover

SPADNS

Sulfuric acid

Alkaline Cyanide

Neutralized Cyanide

All Neutralized Sampling Waste Containing Any of the Above.

Section III

Health Hazards

I. Health Hazards

A. Local

1. Irritants

Chemicals, which are not corrosive, but which cause a reversible inflammatory effect on living tissue by chemical action at the site of contact.

2. Corrosives

Chemicals that cause visible destruction or irreversible alterations in living tissue by chemical action at the site of contact.

B. Systemic

1. Toxics

Toxics are chemicals that have a lethal dose (LD(50)) of 50-500 mg/kg orally. 200-1,000 mg/kg skin contact. 200-2,000 mg/kg by volume of vapor or gas, or 2-20 mg/L of mist, fumes, or dust by inhalation.

a. Acute/Chronic

i. Acute effects occur rapidly as a result of short term exposures and are of short durations. Generally irritation, corrosivity, sensitization, and lethal dose.

ii. Chronic effects are a result of long term exposure and are of long duration. Examples are carcinogenicity, teratogenicity, and mutagenicity.

b. Nervous system effects

Neurotoxins are chemicals that have their primary effect on the nervous system. Narcosis, behavioral changes, and decrease in motor functions are the major signs and symptoms. Chemicals that affect the nervous system are mercury and carbon disulfide.

c. Respiratory system effects

- i. Chemicals that act on the blood or hematopoietic system which decreases the function of hemoglobin and deprive the body tissue of oxygen. The signs and symptoms are cyanosis (turning blue) and loss of consciousness. Carbon monoxide and cyanides are chemicals that have this effect.
- ii. Lung damaging chemicals can irritate or damage pulmonary tissue. Coughing, tightness in chest and shortness of breath are signs of lung damage. Chemicals that can cause this are silica and asbestos.

d. Reproductive system effects

Reproductive toxins are those that affect the reproductive capabilities like chromosomal mutations and teratogenesis (effects on the fetus). Signs of reproductive toxins are birth defects and sterility. Lead and DBCP cause these types of effects.

e. Sensitizers

Sensitizer is a chemical that causes most exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

f. Carcinogens

A carcinogen is a chemical that has been evaluated by IARC and has been found to cause cancer or have the potential to cause cancer. A carcinogenic chemical will also be listed in the Annual Report on Carcinogens that is published by the National Toxicology Program.

II. Route of Exposure

A. Inhalation

Inhalation exposure is caused by breathing in a substance through the nose and mouth.

B. Skin Absorption

Skin absorption occurs when a substance is taken in through the pores of the skin and covering of the eyes.

C. Ingestion

Ingestion is when substances are taken in through the mouth to the stomach.

III. Amount of Absorption

A. Gases and Vapors

Are a serious inhalation hazard because they are not as readily seen as a dust, mist, or fumes. They can also be odorless like carbon monoxide and radon.

B. Particulates

1. Dust

Dry, solid particles suspended in the air.

2. Mist

Wet, liquid particles suspended in the air.

3. Fume

Exhaust and results of chemical reactions.

IV. Dose

A. Work Practices

Hygienic work practices will help prevent any possible exposures from equipment or tools.

B. Personal Hygiene

Good personal hygiene will help prevent exposure from lingering contaminants on clothing, hair, or skin.

C. Weight

A larger/heavier person will require more exposure (longer or higher concentration) to get the same doses as a smaller/lighter person.

D. Personal Protective Equipment

Will prevent the possibility of being dosed at a high exposure and can keep the dose low enough to not harm an individual wearing PPE properly.

E. Environmental Controls

Environmental controls will help keep the potential for exposure to a minimum with ventilation, barriers, dams, and dikes.

V. Duration of Exposure

The seriousness of an exposure can depend on the chemical itself or the duration of the exposure to a certain chemical. The longer the exposure, the worse the effects will be. For some chemicals, a short exposure can be deadly because of the chemical concentration.

VI. Exposure Limits including PELs

A. To protect workers against health effects of exposure to hazardous substances the permissible exposure limit for each chemical was developed. PELs are regulatory maximum limits on the amount or concentration of a substance in the air. They may also contain a skin designation. PELs can be defined by ceiling value or time weighted average. A ceiling value is a limit that can never be exceeded. It is denoted with a C in OSHA regulation 1910.1000. The time weighted average (TWA) is the average value of exposure over an 8-hour shift. TWAs are usually lower than ceiling values. TWAs can be exceeded for part of the day as long as exposure is below the TWA for the rest of the day.

If there is no PEL listed for a substance it does not necessarily mean it is harmless. OSHA has not assessed the substance to develop a PEL.

B. Established by:

1. Chemical similarities
Chemicals that have the same effects of chemicals that are carcinogens or noncarcinogens.
2. Animal studies
Since human evidence is not always readily available, many toxicology studies are performed on animals to predict the health effects that humans may experience if exposed to a substance.
3. Human studies
When epidemiological studies and case reports are available, these are used to determine the health effects of a substance.

VII. Air Sampling

A. Required by OSHA

1. Is required if there is a standard that regulates exposure levels.

2. Conduct representative full-shift sampling for air contaminants when determining compliance with an 8-hour TWA-PEL. Full-shift sampling is defined as a minimum of the total time of the shift less 1 hour. Make every attempt to sample as much of the work shift as possible and include segments of greatest exposure during the sampling periods. However, no more than 8 hours of sample can be used in the 8-hour TWA-PEL calculation. A representative exposure sample period may be less than 7 hours; however, the final analytical result and associated calculation could still result in non-compliance when averaged over 8 hours.
3. Extended Work Shifts: Compliance officers can choose one of two approaches for employees who work extended shifts beyond 8 hours. The choice taken will depend on the nature of the hazardous chemical and the work activity being performed.
 - a. The first approach is to sample what the compliance officer believes to be the worst continuous 8-hour work period of the entire extended work shift.
 - b. The second approach is to collect multiple samples over the entire work shift. Sampling is done so that multiple personal samples are collected during the first 8-hour work period and additional samples are collected for the extended work shift. Unless a compliance officer is dealing with lead, the employee's exposure in this approach is calculated based upon the worst 8-hours of exposure during the entire work shift. Using this method, the worst 8-hours do not have to be contiguous.

B. Employee reports of illness

Shall be kept on record and reported appropriately. If medical attention is required, the employee shall have access to the providing clinic or hospital listed in the Chemical Hygiene Plan. The CHO will also be notified and will provide appropriate documentation to physicians. The officer will also take steps to avoid further and future exposures.

C. Confined Space Work

All air sampling for confined space work shall be performed in accordance with our Confined Space Entry Program. The binder containing this information is available in the Control Room. Air sampling shall be conducted prior to any entry and continuous while entrants are in the permit required confined space. Oxygen shall be tested for first since an oxygen deprived atmosphere can cause false readings for combustible gases. All air sampling results will be recorded in the entry permit and will be recorded periodically during the entry.

VII. Response

A. Age

Those who are very young or very old will have a worse effect from a substance because of the increased susceptibility to illness or disease.

B. Gender

Some select substances that have effects on reproductive health can be more severe for one gender over the other.

C. Body Size

A person with a larger body mass will require more of a substance to have an effect generally. A smaller body mass will be effected more quickly by the same air borne concentration than that of a larger body mass.

D. Health Status

A person in good health will be able to recover better from an exposure and will be more resistant to the effects. A less healthy person will have more severe signs and symptoms from the same substance.

E. Personal Habits

Smoking, chewing, drinking, or other drugs can increase an effect of a substance on a person.

F. Other Exposures

A person who has had previous exposures to a substance or exposures to other substance can experience worse signs and symptoms.

VIII. Employee Concerns

A. Symptoms limited/many causes

Several substances and chemicals can cause similar effects so it can be difficult to determine exactly which substance or chemical caused the effect. It is important to take heed to all warnings and PPE requirements of substances that are in the MSDS.

B. Documentation

Documentation is available at the end of the Chemical Hygiene Plan in the form of the 29 CFR 1910.1450 along with Appendix A. Also included are the 29 CFR 1910.1000 Table Z-1 and Z-2.

Also available in the lab is 21st Ed. Standard Methods.

Links available online:

www.osha.gov

<https://erd.dli.mt.gov/safetyhealth/sbhome.asp>

C. Referral

Employees who have additional concerns can contact the MT State Dept. of Labor and Industry, the City of Bozeman Human Resources Dept., or an OSHA Office.

D. Refusal to Work

Employees have the right to refuse a task if it will endanger their health or physical wellbeing without the proper personal protective equipment and engineering controls.

Section IV

Bloodborne Pathogen Exposure Control Plan

The City of Bozeman Water Treatment Plant is committed to providing a safe and healthy work environment for all employees. The exposure control plan is provided to eliminate or minimize occupational exposure to bloodborne pathogens in accordance with OSHA Standard 29 CFR 1910.1030.

The Exposure Control Plan is designed to assist in implementing and ensuring compliance with the standard and protecting our employees. Included in this plan are:

- Determination of employee exposure
- Implementation of various methods of exposure control
- Hepatitis B vaccination
- Post-exposure evaluation and follow-up
- Communication of hazards to employees and training
- Recordkeeping
- Procedures for evaluating circumstances surrounding exposure incidents

I. Program Administration

The Chemical Hygiene Officer is responsible for the Exposure Control Plan and will maintain, review, and update it annually or whenever necessary.

Employees who have an occupational exposure to blood or other potentially infectious materials (OPIM) must comply with the procedures and work practices outlined in this ECP.

The Laboratory Coordinator will ensure that adequate supplies of PPE and engineering controls are available in the appropriate sizes.

II. Employee Exposure Determination

Employees of the Water Treatment Plant who are working in the laboratory, operations, and maintenance have the potential to have occupational exposure to bloodborne pathogens.

III. Methods of Implementation and Control

A. Universal Precautions

All employees will utilize universal precautions. According to the concept of Universal Precautions, all human blood and certain body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

B. Exposure Control Plan

1. Employees covered by the bloodborne pathogens standard receive an explanation of this ECP during their initial training session. It will also be reviewed in annual refresher training. All employees can review this plan at any time during their work shifts by reading the BMP and the ECP contained in it. The BMP and ECP are located in the Laboratory.
2. The CHO is responsible for reviewing and updating the ECP annually or more frequently as necessary for any new or modified tasks and procedures that may affect occupational exposure.

C. Engineering Control and Work Practices

1. Engineering controls and work practice controls will be used to prevent or minimize exposure to bloodborne pathogens. The controls are:
 - a. Wastewater containers/secondary containers
 - i. Must be puncture resistant or glass
 - ii. labeled as wastewater samples
 - iii. must be leak-proof
 - b. Hand washing facilities
 - i. must be readily accessible to employees
 - ii. soap and running water or antiseptic cleaner with paper towels
 - iii. antiseptic towelettes
 - iv. wash hands immediately after removal of gloves or other personal protective equipment.
 - c. Eating, drinking, smoking, applying cosmetics, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure.
 - d. All procedures involving samples that may contain blood or other potentially infectious materials will be performed in a manner to minimize splashing, spraying, spattering, and generation of droplets of the substance.

D. Personal Protective Equipment

1. When there is potential exposure, the City will provide PPE at no cost to the employee. Training in the use of appropriate PPE for specific tasks or procedures is provided by the Laboratory Coordinator. PPE will be readily accessible and available to all employees working in the Laboratory.
 - a. Gloves
 - i. Disposable nitrile or latex gloves
 - ii. Heavy duty rubber gloves over nitrile or latex gloves for housekeeping duties.
 - b. Coveralls, aprons, or lab coats to protect against potentially infected fluids.

2. Care and Maintenance of PPE

Once PPE is assigned, it is the employee's responsibility to maintain it. All employees must observe precautions in the care and maintenance of the PPE.

- a. Wash hands immediately after removing gloves or other PPE.
- b. Remove PPE after it becomes contaminated and before leaving the work area.
- c. Wear appropriate gloves when working with dosing tank effluent as there may be hand contact with blood or other potentially infectious materials and when handling or touching contaminated items. Replace gloves if torn, punctured or contaminated, or if their ability to function as a barrier is compromised
- d. Heavy duty rubber gloves can be reused as long as they are decontaminated after use and their integrity is not compromised. Discard heavy duty gloves if they show signs of cracking, peeling, tearing, puncturing, or deterioration.
- e. Never wash or decontaminate disposable gloves for reuse.
- f. Wear appropriate face and eye protection when splashes, sprays, spatters, or droplets of potentially infectious material pose a hazard to the eyes, nose, or mouth.

- g. Contact the Laboratory Coordinator for instructions regarding the handling of used PPE.

E. Housekeeping

1. Laboratory

Employees will ensure that the laboratory is maintained in a clean and sanitary condition. The lab will be cleaned after each use or at the end of the work shift, whichever is more feasible. All lab surfaces will be decontaminated after analysis of dosing tank effluent and raw water samples. A disinfecting cleaner solution will be used to clean the lab counter tops and equipment.

2. Laundry

Contaminated laundry (lab coats, coveralls, aprons) will be bagged and handled to prevent spreading contamination. It will then be washed in the Water Treatment Plant washing machine. Employees handling the contaminated laundry must wear disposable gloves. All lab coats, coveralls, and aprons will be periodically laundered to help extend its useful life.

IV. Hepatitis B Vaccination

The City will provide information to employees on hepatitis B vaccinations, addressing safety, benefits, efficacy, methods of administration and availability.

The hepatitis B vaccination series is available at no cost at initial employee physical at the Water Treatment Plant. Vaccination is encouraged unless: documentation exists that the employee has previously received the series; antibody tests reveals that the employee is immune; or medical evaluation shows that vaccination is contraindicated.

However, if an employee declines the vaccination, the employee must sign a declination form. Employees who decline may request and obtain the vaccination at a later date at no cost. Documentation of refusal of the vaccination is kept in the Human Resource Department.

Vaccination and boosters will be provided by the Bozeman Deaconess Health Group 915 Highland Blvd, Bozeman, MT.

V. Post-Exposure Evaluation and Follow-up

A. Actions

Should an exposure incident occur, contact the Chemical Hygiene Officer, Chief Operator, or Plant Superintendent. The affected employee should immediately seek medical attention at Bozeman Deaconess Hospital. Following initial first aid, the following activities must occur:

1. A Report of Exposure is to be completed documenting the routes of exposure, how the exposure occurred, the identity of the source (if known), and consent from the source for testing to determine HIV, HCV, and HBV infectivity.
2. The treating facility will obtain consent and collect the exposed employee's blood as soon as feasible after the exposure incident. The blood will be tested for HBV and HIVserological status.

B. Administration

The treating facility will provide the employee with a copy for the evaluating health care professional's opinion within 15 days after completion of the evaluation.

C. Follow-up Procedures

The Water Plant Superintendent will review the circumstances of all exposure incidents to determine:

1. Engineering controls in use at the time.
2. Work practices followed.
3. A description of the device being used.
4. Protective equipment or clothing that was used at the time of the exposure incident.
5. Location of the incident.
6. Procedures/duties being performed when incident occurred.
7. Employee's training.

VI. Employee Training

All employees who have occupational exposure to bloodborne pathogens receive initial and annual training conducted by the Laboratory Coordinator or their selected representative. All employees who have occupational exposure to bloodborne pathogens receive training on the pattern of disease development, symptoms, and transmission of bloodborne pathogen diseases. In addition, the training program covers, at a minimum, the following elements:

- A copy and explanation of the OSHA bloodborne pathogen standard.
- An explanation of the City of Bozeman Water Treatment Plant's Exposure Control Program and where copies are located.

- An explanation of methods to recognize tasks and other activities that may involve exposure to blood and potentially infectious materials, including what constitutes an exposure incident.
- An explanation of the use and limitations of engineering controls, work practices, and PPE.
- An explanation of the types, uses, location, removal, handling, decontamination, and disposal of PPE.
- An explanation of the basis for PPE selection.
- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine is offered free of charge.
- Information on the appropriate actions to take and persons to contact in an emergency involving a potentially infectious material.
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available.
- Information on the post-exposure evaluation and the follow-up that the employer is required to provide for the employee following an exposure incident.
- An explanation of signs and labels required by the standard and used by the City of Bozeman Water Treatment Plant.
- An opportunity of interactive questions and answers with the person conducting the training session.

VII. Recordkeeping

A. Medical Records

Medical records are maintained for each Water Treatment Plant employee with occupational exposure in accordance with 29 CFR 1910.1020, "Access to Employee Exposure and Medical Records."

The Human Resource Director will maintain the required medical records to ensure they are confidential and kept in a secure location in the Human Resource Department for at least the duration of employment plus 30 years.

Employee medical records are provided upon written request of the employee or to anyone having written consent of the employee within 15 working days. Such requests should be submitted to: City of Bozeman, Human Resource Department, P.O. Box 1230, Bozeman, MT 59771.

B. Training

Training records are completed for each employee upon completion of training. These documents will be kept for at least three years in the Chemical Hygiene Officer office and in the Human Resource Department.

The training records will include:

- Dates of the training sessions.

- Contents or a summary of the training sessions.
- Names and qualifications of persons conducting the trainings.
- Name and job titles of all persons attending the training sessions.

C. OSHA Recordkeeping

An exposure incident is evaluated to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904). This determination and the recording activities are completed by the Water Treatment Plant Superintendent and Chemical Hygiene Officer.

Hepatitis B Vaccine Declination Form

Employee Name: _____ Date: _____

Address: _____

Company: _____ Job Title: _____

Job Duties: _____

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline the hepatitis B vaccination at this time.

I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee signature: _____ Date: _____

Section V

Standard 29 Code of Federal Regulations (CFR) 1910.1450

1910.1450(a)

Scope and application.

1910.1450(a)(1)

This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

1910.1450(a)(2)

Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:

1910.1450(a)(2)(i)

For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

1910.1450(a)(2)(ii)

Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

1910.1450(a)(2)(iii)

Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.

1910.1450(a)(3)

This section shall not apply to:

1910.1450(a)(3)(i)

Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z, even if such use occurs in a laboratory.

1910.1450(a)(3)(ii)

Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

1910.1450(a)(3)(ii)(A)

Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

1910.1450(a)(3)(ii)(B)

Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

1910.1450(b)

Definitions --

Action level means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Carcinogen (see select carcinogen).

Chemical Hygiene Officer means 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 definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

Combustible liquid means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas means:

- (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or
- (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or
- (iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

Designated area means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Explosive means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable means a chemical that falls into one of the following categories:

(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **Gas, flammable** means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(iii) **Liquid, flammable** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a

viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

Laboratory means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale means 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. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

(i) Chemical manipulations are carried out on a "laboratory scale;"

(ii) Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Organic peroxide means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer means a chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Protective laboratory practices and equipment means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive toxins means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select carcinogen means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³;

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

Unstable (reactive) means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Water-reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

1910.1450(c)

Permissible exposure limits. For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

1910.1450(d)

Employee exposure determination --

1910.1450(d)(1)

Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

1910.1450(d)(2)

Periodic monitoring. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

1910.1450(d)(3)

Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.

1910.1450(d)(4)

Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

1910.1450(e)

Chemical hygiene plan -- General. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

1910.1450(e)(1)

Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

1910.1450(e)(1)(i)

Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

1910.1450(e)(1)(ii)

Capable of keeping exposures below the limits specified in paragraph (c) of this section.

1910.1450(e)(2)

The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.

1910.1450(e)(3)

The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;

1910.1450(e)(3)(i)

Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

1910.1450(e)(3)(ii)

Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

1910.1450(e)(3)(iii)

A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

1910.1450(e)(3)(iv)

Provisions for employee information and training as prescribed in paragraph (f) of this section;

1910.1450(e)(3)(v)

The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

1910.1450(e)(3)(vi)

Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

1910.1450(e)(3)(vii)

Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and

1910.1450(e)(3)(viii)

Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

1910.1450(e)(3)(viii)(A)

Establishment of a designated area;

1910.1450(e)(3)(viii)(B)

Use of containment devices such as fume hoods or glove boxes;

1910.1450(e)(3)(viii)(C)

Procedures for safe removal of contaminated waste; and

1910.1450(e)(3)(viii)(D)

Decontamination procedures.

1910.1450(e)(4)

The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

1910.1450(f)

Employee information and training.

1910.1450(f)(1)

The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

1910.1450(f)(2)

Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

1910.1450(f)(3)

Information. Employees shall be informed of:

1910.1450(f)(3)(i)

The contents of this standard and its appendices which shall be made available to employees;

1910.1450(f)(3)(ii)

the location and availability of the employer's Chemical Hygiene Plan;

1910.1450(f)(3)(iii)

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

1910.1450(f)(3)(iv)

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

1910.1450(f)(3)(v)

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

1910.1450(f)(4)

Training.

1910.1450(f)(4)(i)

Employee training shall include:

1910.1450(f)(4)(i)(A)

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

1910.1450(f)(4)(i)(B)

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

1910.1450(f)(4)(i)(C)

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

1910.1450(f)(4)(ii)

The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

1910.1450(g)

Medical consultation and medical examinations.

1910.1450(g)(1)

The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

1910.1450(g)(1)(i)

Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

1910.1450(g)(1)(ii)

Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

1910.1450(g)(1)(iii)

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, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

1910.1450(g)(2)

All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

1910.1450(g)(3)

Information provided to the physician. The employer shall provide the following information to the physician:

1910.1450(g)(3)(i)

The identity of the hazardous chemical(s) to which the employee may have been exposed;

1910.1450(g)(3)(ii)

A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

1910.1450(g)(3)(iii)

A description of the signs and symptoms of exposure that the employee is experiencing, if any.

1910.1450(g)(4)

Physician's written opinion.

1910.1450(g)(4)(i)

For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

1910.1450(g)(4)(i)(A)

Any recommendation for further medical follow-up;

1910.1450(g)(4)(i)(B)

The results of the medical examination and any associated tests;

1910.1450(g)(4)(i)(C)

Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and

1910.1450(g)(4)(i)(D)

A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

1910.1450(g)(4)(ii)

The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

1910.1450(h)

Hazard identification.

1910.1450(h)(1)

With respect to labels and material safety data sheets:

1910.1450(h)(1)(i)

Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

1910.1450(h)(1)(ii)

Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

1910.1450(h)(2)

The following provisions shall apply to chemical substances developed in the laboratory:

1910.1450(h)(2)(i)

If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

1910.1450(h)(2)(ii)

If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.

1910.1450(h)(2)(iii)

If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.

1910.1450(i)

Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

1910.1450(j)

Recordkeeping.

1910.1450(j)(1)

The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.

1910.1450(j)(2)

The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.1020.

1910.1450(k)

[Reserved]

1910.1450(l)

Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[55 FR 3327, Jan. 31, 1990; 55 FR 7967, March, 6, 1990; 55 FR 12777, March 30, 1990; 61 FR 5507, Feb. 13, 1996; 71 FR 16674, April 3, 2006]

Section VI

Medical Consultation and Examination

The City of Bozeman Water Treatment Plant, through Bozeman Deaconess Hospital, shall provide, to affected employees, medical attention including follow up examinations which Workman's compensation determines are necessary under the following circumstances:

- A. Whenever an employee develops signs and symptoms associated with a hazardous chemical to which they may have been exposed, the employee will be provided an opportunity to receive appropriate medical attention. The employee will contact the Chemical Hygiene Officer to initiate the medical program.
- B. 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, the affected employee, laboratory or custodial, will be provided an opportunity for a medical consultation. This consultation is for the purpose of determining the need for a medical examination.
- C. All medical examinations and consultations are provided by Bozeman Deaconess Hospital. All aspects of these examinations are provided by a licensed physician, or supervised by a licensed physician. These examinations are provided without cost to the employee, without loss of pay, and at a reasonable time and place.
- D. The Chemical Hygiene Officer will provide the following information to the physician:
 - 1. Identity of the hazardous chemical to which the employee may have been exposed including appropriate SDS.
 - 2. A description of the conditions of the exposure including exposure date if available.
 - 3. A description of signs and symptoms of exposure that the employee is experiencing (if any).
- E. The written opinion that the company receives from the physician will include:
 - 1. Recommendations for future medical follow up.
 - 2. Results of examination and associated tests.
 - 3. Any medical condition revealed which may place the employee at increased risk as the result of a chemical exposure.

4. A statement that the employee has been informed by the physician of the results of the examination/consultation and told of any medical conditions that may require additional examination or treatment.
 5. A return to work authorization from the physician.
- F. The material returned to the City of Bozeman Water Treatment Plant by the physician will not include specific findings and diagnosis which are unrelated to occupational exposure.

Section VII

Laboratory Standard Training Outline

I. Introduction

The Chemical Hygiene Plan and Laboratory Best Management Practices Plan is a written program developed and implemented by the City of Bozeman Water Treatment Plant in accordance with standard 29 CFR 1910.1450, which sets forth procedures, equipment, and work practices that are capable of protecting employees from the health hazards presented by chemicals used in the laboratory. This plan must be followed by The City of Bozeman Water Treatment Plant employees and visitors that may be in the laboratory.

A. Location and explanation of Chemical Hygiene Plan and Laboratory BMP Plan

The Chemical Hygiene Plan and Laboratory BMP Plan are located in the Water Treatment Plant Laboratory and Control Room. The Chemicals Hygiene Plan is a requirement by OSHA and the Montana Safety Act to safeguard the health and safety of employees that may be exposed to potentially hazardous chemicals while working in the laboratory. The Laboratory Best Management Practices Plan is a requirement of the MT DEQ to assure that no hazardous chemicals enter our septic system. Also included in this outline are the treatment chemicals used by the City of Bozeman Water Treatment Plant in the water treatment process as they can be used in the laboratory for jar testing.

B. Location of reference materials and safety data sheets (SDS)

Reference materials are located in the Chemical Hygiene Plan binder as well as online at www.osha.gov. The SDS binders are located in the laboratory as well as outside the Control Room for all employees to review.

C. Details of access to medical consultation and management system

Medical consultation is detailed in the body of the Chemical Hygiene Plan and the Laboratory BMP Plan and will be provided by Bozeman Deaconess Hospital with any follow up approved by Workman's Compensation as needed. Any employee will be provided the opportunity for medical examination if the employee develops any signs or symptoms which may be associated with exposure to hazardous chemicals or bodily fluids.

II. Physical Hazards

A chemical is considered a physical hazard if there is valid scientific evidence that it a combustible liquid, compressed gas, explosive, flammable, organic peroxide, oxidizer, pyrophoric, unstable, or water reactive.

A. Combustible Liquid

OSHA defines it as “any liquid having a flash point at or above 100 degrees F., but below 200 degrees F., except any mixture having components with flashpoints of 200 degrees F, or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.” OSHA divides these into several classes in 29 CFR 1910.106.

B. Compressed Gas

The physical hazards of compressed gas include explosion, rupture, and other hazards associated with high pressure systems. Oxygen displacement, fires, and toxic gas exposure are other types of hazards associated with compressed gas. There has to be special storage, use, and handling precautions and procedures in place to control the potential hazards. A gas or mixture of gases having an absolute pressure exceeding 104 psi at 130 degrees F or a liquid having a vapor pressure exceeding 40 psi at 100 degrees F are considered compressed gases.

C. Explosive

A chemical compound, mixture, or device that is capable of exploding, or a compound or mixture susceptible to rapid chemical reaction, decomposition, or combustion with the rapid generation of heat and gases with a combined volume much larger than the original substance. High explosives have very high rate of reactions, high pressure, and detonation waves faster than the speed of sound (nitroglycerin and TNT are examples). Low explosives have lower reaction rate and have deflagration (rapid burning or combustion) (Black powder is a common example).

D. Flammable

OSHA defines it as “any liquid having a flashpoint below 100 degrees F, except any mixture having components with flashpoints of 100 degrees F or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Flammable gas is any gas which forms a flammable mixture with air at a concentration of 13% by volume or less. A flammable solid is any solid, other than a blasting agent or explosive, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and burns vigorously.

E. Organic Peroxide

An organic peroxide is a chemical that contains carbon, hydrogen, nitrogen, oxygen, phosphorous, and sulfur along with the peroxy unit. The chemical formula for peroxy unit is O_2^{-2} . The most familiar is hydrogen peroxide. A hydroperoxide contains the O-O-H molecule. Hydrogen peroxide is also an example of this. Most organic chemicals contain peroxides.

Several precautions need to be taken with peroxide forming materials: do not store in clear glass bottles (use amber transparent bottles), do not store near heat, sunlight, or ignition sources; do not use high risk items, never touch or open a bottle of peroxide forming liquid if there are whitish crystals around the cap or in the bottle.

F. Oxidation and Reduction

Oxidation is the loss of electrons from an atom, compound, or molecule. Generally it is the reaction of a substance containing oxygen adds oxygen atoms to the compound being oxidized. When something is oxidized, something else must go through reduction.

Reduction is the opposite of oxidation. In general, reduction is the giving up of electrons in the oxidation-reduction process.

A common example is the reaction of hydrogen with oxygen to form water.

G. Pyrophoric

Pyrophoric materials are ones that can spontaneously ignite in air. These materials have to be stored in special inert atmosphere or nitrogen or argon using special glassware. It can promote combustion in other materials causing fire of itself or through the release of oxygen or other gases.

H. Unstable Chemical

An unstable chemical is any chemical which in its pure state or as produced or transported will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shocks, pressure, or temperature changes.

I. Water Reactive

Water reactive chemicals are those that will react chemically with water. Flammable or toxic gas is released as a result. There is also heat generated that can be enough for the substance to spontaneously combust or explode. Sodium metal and potassium are good examples of water reactive substances.

III. Standard Operating Procedures

All laboratory procedure standard operating procedures are outlined in the Laboratory Procedures binder the Water Treatment Plant Laboratory. Laboratory procedures that are not in the binder are available in the operations manuals for specific instruments in other binders in the lab. All other lab procedures that are not commonly performed with the Hach DR 6000 Spectrophotometer need to be obtained from the Lab and Compliance Coordinator.

Standard operating procedures for treatment chemicals handling and loading are located in the Standard Operating Procedures binder located in the Control Room.

Laboratory Safety Rules:

1. Always follow the written instructions for every test.
2. Always wear protective clothing when working with chemicals.
3. Wear protective eyewear.
4. Never bring food or drink into the laboratory or place food or drink on the counters.
5. Never mouth pipets, always use bulbs.
6. Always wear disposable gloves when working with corrosives, carcinogens, or hazardous chemicals.
7. Do not pour hazardous chemicals down the laboratory sink. Neutralize and dilute hazardous chemicals then pour them down the waste disposal sink.
8. Run tests that require a fume hood in the fume hood. If assistance is needed consult the Laboratory Coordinator.
9. Always add acid to water, but water to base.
10. Wash down counters, clean glassware, and instruments after testing is completed.
11. Wash hands and remove lab coats before exiting the laboratory.

Complete List of Laboratory Chemicals Used in Our Lab

Sodium Hypochlorite 12.5%
Sodium hydroxide (caustic solution) 35%
Acetic acid (Glacial)
Acid Reagent
Compressed Air
Alconox Detergent
Alkaline Cyanide Reagent
Aluminum Standard solution 50 mg/L
AluVer 3 Aluminum Reagent
Ammonia Cyanurate Reagent PP
Ammonia Salicylate Reagent PP
Ammonium Chloride Reference Electrolyte
Ammonium hydroxide
Ascorbic acid
Bleaching 3 Reagent

Bromcresol Green-Methyl Red indicator
Buffer Powder Citrate
Buffer Powder Pillows pH 7
Buffer Powder Pillows pH 10
Buffer solution pH 4.01
Buffer solution pH 7.00
Buffer solution pH 10.00
Buffer solution hardness 1 pH 10.1
Calcium, Total Hardness Ampule 10,000mg/l
CalVer 2 Calcium Indicator
Carbon Monoxide in Air (compressed)
Chloride reference standard 0.0282 N
Chloride reference standard 0.00282 N
Chloride Ionic Strength Adjustment Buffer
Chlorine standard solution 25-30 mg/L
Chlorine Standard Solution 50-75 mg/l
Chlorine Standard Solution >100 mg/l
Total Chlorine Buffer Solution
Total Chlorine Indicator
DPD for Free & Total Chlorine Analyzers
Free Chlorine Indicator Solution for Cl-17
Free Chlorine Buffer for Cl-17
DPD Free Chlorine reagent
SwifTEST DPD Free Chlorine Reagent
DPD Total Chlorine Reagent
SwifTEST DPD Total Chlorine Reagent
CuVer Copper reagent
Desiccant, Indicating
Dissolved Oxygen reagent
TitraVer Solution (Sodium EDTA) 0.800M
EDTA Tetrasodium Salt 0.8 M
Electrode Cleaning Solution
Electrode Filling Solution 0.02M NH₄Cl
Ferrous Ammonium Sulfate standard 0.25
Ferrover iron reagent
Fluoride adjustment buffer
Fluoride electrode filling solution
0.5 mg/L fluoride standard 1
5.0 mg/L fluoride standard 2
TISAB solution reagent 1
Fluoride standard solution 1.00 mg/L
Fluoride standard solution 0.2 mg/L
Formazin turbidity standard 4000 NTU
GLI EquiTransferrant 7 pH Buffer
GLI 1.5 M EquiTranferrant Salt Solution
GLI ORP Test Solution, 200 mV

GLI ORP Test Solution, 600 mV
Standard Hydrochloric Acid 0.10 N
Hydrochloric acid ACS grade
Iron standard solution 25 mg/L
TPTZ Iron Reagent
3M KCl Solution saturated with AgCl
Lab Solutions Powder Detergent
Lab Solutions Neutralizing Acid Rinse
Lubrised Stopcock Grease
Manganese standard solution 25 mg/L
ManVer 2 hardness indicator
NitraVer 5 nitrate reagent
Nitric acid solution 1:1
Nitrocellulose membrane filter
PAN indicator solution 0.1%
pH Electrode Storage Solution Reagent
Phenol red indicator solution
Phenolphthalein Indicator Powder
PhosVer 3 Phosphate Reagent
Potassium Chloride Electrolyte Solution
Potassium Hydroxide Solution 8N
Rover (rust remover)
Silicon oil
Sodium chloride
Sodium Chloride Standard Solution 85.5mg/l
Sodium standard solution 100 mg/l
Sodium chloride standard solution 1000mg/l
Sodium Reference Standard 1000 mg/l
Sodium Electrode Storage Solution
Na and K Ionic Strength adjuster powder
Sodium hydroxide solution 0.10N
Sodium periodate
SPADNS Reagent
SPADNS 2 reagent
Stabilized Sodium Thiosulfate 2.12 N
StablCal Certified Standard 800 mNTU
<0.1 NTU Calibration Solution
StablCal Solution <0.1 NTU
StablCal solution 20 NTU
StablCal Formazin Standard 20 NTU
StablCal Formazin Standard 100 NTU
StablCal Standard 100 NTU
StablCal Standard 400 NTU
StablCal Standard 800 NTU
StablCal Formazin Standard 800 NTU
StablCal Verification Ampule 10 NTU

Sulfate standard solution 50 mg/L
SulfaVer 4 sulfate reagent
Sulfuric acid 0.16N
Sulfuric acid 1.600 N
Sulfuric Acid Solution 5.25N
Sulfuric acid 19.2 N

Production Chemicals Complete List

Aluminum Chlorohydrate (T-Floc B-135)
T-Floc 4027 Polymer
Calcium Thiosulfate solution (Captor)
Citric Acid 50%
Sodium permanganate (future use)
Calcium hypochlorite
Fluorosilicic acid
Sodium Hypochlorite 12.5%
Sodium hydroxide (caustic solution) 35%