

CHEMICAL HYGIENE PLAN

August 2022

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Revised from Original CHP dated February 2010

Former Laboratory and Safety Coordinator: David Gordon

Former Chemical Hygiene Officer: Steve Ballou

PURPOSE

The purpose of the Chemical Hygiene Plan is to minimize exposure to and enhance communications about hazardous chemicals to the employees and students of Beloit College. *All chemicals should be treated as hazardous materials until proven otherwise.*

SCOPE

This plan applies to laboratory and art studio operations using hazardous chemicals in relatively small quantities. For operations involving non-hazardous chemicals, and in areas not designated as laboratories/studios, the other standards of 29 CFR Part 1910 (OSHA) are applicable. In addition to the provisions of this plan, all applicable sections of the Beloit College Hazard Communication Plan shall also apply.

OBJECTIVE

The objective of this plan is to promote the health and safety of the laboratory/studio personnel and students of Beloit College. This objective will be accomplished by establishing proper handling and experimental procedures, personnel training, a written chemical hygiene plan in compliance with 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories" (OSHA Laboratory Standard), as well as the identification of other applicable regulations the College is required to follow.

1.0 GENERAL PRINCIPLES

The intent of the Chemical Hygiene Plan is to provide guidelines for handling and using chemicals without causing harm to self, other employees, students, or to the College environment. Beloit College employees/students will:

- 1.1 Minimize exposure to chemicals both with and without known hazards. Wear proper personal protective equipment and know the limitations of protective equipment. If pregnancy is suspected, seek medical advice prior to working in a laboratory/studio.
- 1.2 Avoid underestimation of risk by treating all chemical compounds of unknown toxicity as if toxic.
- 1.3 Provide exposure assessment by furnishing appropriate signs to indicate storage of and/or usage of hazardous material; furnishing proper instruction regarding storage of chemicals; furnishing general instruction on fundamental rules to be followed when working with hazardous substances.
- 1.4 Provide engineering control methods such as the use of enclosures, laboratory fume hoods, glove boxes, and local exhaust ventilation. Various other means may be applied in addition to but not necessarily in place of personal protective equipment. Personal protective equipment may consist of eyewear, gloves, lab coats, chemical aprons, respirators, etc.
True respirators must be fitted by a professional.

2.0 LEVELS OF RESPONSIBILITY

2.1 PRESIDENT OF THE COLLEGE

Has ultimate responsibility for chemical hygiene within the College and must with other administrators, provide continuing support for chemical hygiene.

2.2 SAFETY & COMPLIANCE OFFICERS (SCO)

Have direct, overall responsibility for all Beloit College chemical hygiene activities and the health and safety of students/employees in sites on campus; however, he/she may delegate functional responsibilities for selected activities to other personnel of the College.

2.3 COLLEGE CHEMICAL HYGIENE OFFICER (CHO)

A technically qualified individual designated by the College whose responsibilities include:

- monitoring and coordinating chemical use in all laboratories and other campus facilities where chemicals are used
- monitoring and coordinating chemical inventories by each unit using chemicals
- monitoring and coordinating maintenance of Material Safety Data Sheets (MSDS) file
- coordinating a written, standardized lab training and procedures program with each instructor;
- conducting inspections of equipment, protective clothing, and procedures
- ensuring that employees/students know and follow the chemical hygiene rules contained in this document.

2.4 CHAIR OF THE DEPARTMENT

Has responsibility for the chemical hygiene in the department.

2.5 LABORATORY/STUDIO FACULTY/SUPERVISOR

The laboratory/studio supervisor/faculty member will with the help of the CHO, be responsible for:

- Ensuring that students know and follow the chemical hygiene rules in this document.
- Ensuring that protective equipment is available and in working order, and that training and information on work rules for that particular laboratory/studio have been provided. This includes providing access to MSDS sheets for chemical compounds used in the laboratory/studio. Providing regular chemical hygiene and housekeeping inspections.
- Providing an inventory of all chemicals and hazardous materials present.
- Monitoring the use and disposal of the chemicals used in the laboratory/studio.
- Placing warning signs and labels on chemical containers, equipment or areas where special or unusual hazards exist.
- Obtaining sufficient information about the hazards of the available chemicals to allow safe handling.
- Properly labeling all secondary containers to which a chemical is transferred other than the original container.
- Informing the CHO of the introduction of new chemicals or hazards to the laboratory/studio and providing the CHO with MSDS sheets for all chemicals ordered.
- Dating containers with the receipt and opening of chemicals that could present long-term storage hazards; e.g., peroxide forming ethers.

2.6 STUDENT LABORATORY/STUDIO WORKERS

Has responsibility for:

- Planning and conduction of each operation in accordance with the chemical hygiene procedures
- Developing good personal chemical hygiene habits.

3.0 GENERAL PROCEDURES FOR LABORATORY/STUDIO CHEMICAL HYGIENE AND SAFETY

Employees/students should be familiar with the following fundamental safety precautions that should be followed at all times:

- **Know the potential hazards** of the materials used in the laboratory/studio. Review the Material Safety Data Sheet (**MSDS or SDS**) and container label prior to using a chemical.
 - **Always wear safety glasses (goggles) and appropriate foot protection (no sandals)** when in the laboratory/studio. If you do get any chemicals in your eyes, flush with plenty of water for at least 15 minutes allowing water from the eyewash fountain or tap to run across the bridge of your nose.
 - **Wear additional personal protective equipment (PPE).** When specific hazards are present chemical resistant gloves should be worn. Additional protective apparel may be required for especially hazardous material.
 - **Know the location of safety equipment** such as emergency showers, eyewashes, fire extinguishers, fire alarms, spill kits, first aid kits, and telephones.
 - **Review emergency procedures** to ensure that necessary supplies and equipment for spill response and other accidents are available.
 - **Practice good housekeeping** minimize unsafe work conditions such as obstructed exits and safety equipment, cluttered benches, floors, and hoods, and accumulated chemical waste.
 - **Store backpacks and coats** on wall hooks and shelves whenever possible. Keep them off the lab bench and off the floor.
 - **Wash skin promptly** if contacted by any chemical. Also, wash your hands before leaving lab, regardless of corrosiveness or toxicity of material involved.
 - **Label all new chemical containers** with the "date received" and "date opened."
 - **Label and store chemicals properly.** All chemical containers should be labeled to identify the container contents (no abbreviations or formulas) and hazard information. Consult the MSDS and/or the TA/Instructor. You should also initial and date the label.
 - **Use fume hoods** when processes or experiments may result in the release of toxic or flammable vapors, fumes, or dusts.
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- **NEVER** Eat, drink, chew gum, or apply cosmetics in areas where chemicals are used and stored.
 - **NEVER** Store food in laboratory/studio refrigerators, ice chests, cold rooms, or ovens.
 - **NEVER** Drink water from laboratory/studio water sources.
 - **NEVER** Use laboratory/studio glassware to prepare or consume food.
 - **NEVER** Smell or taste chemicals.
 - **NEVER** Pipet by mouth.
 - **NEVER** Use equipment unless trained and/or authorized by the instructor.
 - **NEVER** Perform unauthorized experiments.
 - **NEVER** Remove chemicals or equipment from the laboratory/studio.
 - **NEVER** Work alone in the laboratory/studio without prior approval from the lab supervisor.
 - **NEVER** Leave potentially hazardous experiments or operations unattended without prior approval from the lab supervisor. In such instances, the lights in the laboratory/studio should be left on, chemicals being used should be posted, hazards noted, and emergency phone numbers referenced.

ANYONE PLANNING TO WORK WITH MATERIALS CLASSIFIED AS BIOHAZARDS MUST CONSULT WITH THE CHO BEFORE USE. Beloit College is a BSL-1 level institution.

4.0 SPECIFIC LABORATORY/STUDIO SAFETY PROCEDURE

4.1 PROTECTIVE CLOTHING & EQUIPMENT

It is the responsibility of each faculty/student to be certain that the appropriate protective equipment is worn as necessary. Clothing should be worn which will minimize exposure of skin surfaces to direct contact or through splashing; for example, long sleeved/long legged clothing and closed footwear, eye protection, gloves, lab coats, face shields, and aprons. Wearing a respirator and/or using a fume hood is necessary when using chemicals that produce hazardous fumes or gases.

4.2 PERSONAL HYGIENE

- Avoid unnecessary exposure to chemicals by any route. Do not deliberately smell or taste chemicals.
- Do not pipette by mouth.
- Do not eat, drink, smoke, chew gum, bring food or water into the laboratories, chemical storage areas, or work areas where chemicals are present. Chemical vapors can be absorbed by foodstuffs.
- Do not open or apply cosmetics i.e. lip balm, chap stick in the laboratory.
- Do not store food or beverages in laboratory refrigerators or refrigerators labeled for laboratory/studio operations or chemical use.
- Wash your hands after handling chemicals and before leaving the laboratory/studio.
- Change clothing as soon as possible after leaving the laboratory/studio and launder often.

4.3 HOUSEKEEPING

A clean work area is much safer than a cluttered or dirty one. Appropriate housekeeping measures include:

- Keep all aisles, hallways, and stairs clear of all chemicals and hazardous materials.
- Keep all work areas lab benches, hoods, and floor clear of clutter and obstructions.
- Clean work surfaces regularly.
- Do not block access to emergency equipment, showers, eyewashes and exits.
- Do not block or prop open fire doors. (NFPA 80 code 5.2.13.3)
- Dispose of waste chemicals as instructed in properly labeled containers.

4.4 PRECAUTIONS

Before beginning any experiment, consult the SDS(MSDS) for all chemicals used in or produced in the reaction. Carefully note all emergency procedures.

A VelocityEHS/MSDSonline database file is available through Facilities. Binders with MSDS paper copies are available outside 316. And a Chemical Inventory Database file is available through the Chemistry Department.

4.5 WHEN NOT TO PROCEED

Under some conditions, a routine task might contain hazards not fully recognized by the employee/student. **DO NOT CONTINUE** ask for assistance if:

- the procedure is new to you.
- there is a change or substitution in any of the ingredient chemicals in a procedure.
- you encounter failure of any equipment used in the procedure, especially fume hoods or clamp apparatus.
- there are unexpected results from a procedure
- members of the class become ill, If suspect exposure, smell unusual odors, or otherwise suspect a failure of engineered safeguards.

The occurrence of any of these conditions should result in work stoppage and immediate investigation by the laboratory/studio supervisor. The results of the investigation should be reported immediately to the laboratory/studio safety officer who must decide whether to continue investigation, institute any additional corrective actions beyond those of the laboratory/studio supervisor, or allow work to continue.

4.6 SPILLS, ACCIDENTS, AND EMERGENCIES

Spills of toxic substances or accidents involving any hazardous

chemicals should be resolved immediately, according to Beloit College's Hazardous Waste Management Policy. Report all accidents and emergencies to the College's safety & compliance officers if they result in or might be capable of resulting in property damage, injury or illness. The general rules for handling any accident or spill are:

- Notify your supervisor IMMEDIATELY or the Laboratory Coordinator
- If spilled chemical is flammable, extinguish ALL sources of ignition.
- Check the MSDS for proper procedures.
- If a person has been splashed with a chemical or other hazardous material, wash the area with water for at least 15 minutes, remove all contaminated clothing, and GET MEDICAL ATTENTION.
- Call Campus Security: 608-363-2355. They are trained to assist with emergency medical needs of students and employees.
- If a person has been overexposed by inhalation, GET MEDICAL ATTENTION. If fumes are present in the area, evacuate the area and move victim to fresh air, if it is safe to do so.
- In other cases of overexposure, GET MEDICAL ATTENTION and follow the instructions given by medical professionals.
- After securing proper medical attention for a chemical exposure victim, report the incident to the CHO/Stockroom Manager and follow instruction for clean-up. Dispose of clean-up material in accordance with hazardous waste procedures.

There are some fundamental actions which must NOT be used in handling emergencies. Some of them include:

- DO NOT force any liquids into the mouth of an unconscious person.
- DO NOT handle emergencies alone. Always notify someone (Supervisor, Faculty, Lab Coordinator, Campus Security 608-363-2355) that an accident has occurred.
- DO NOT apply medical aid procedures without some training in that area (except to wash with WATER for 15 minutes). If you are not trained in fundamental first aid, get MEDICAL direction before inducing vomit, giving antidotes or applying a "neutralizer" to the skin or eyes of the victim.
- DO NOT linger at the accident scene if you are not one of the emergency responders.

5.0 WASTE CHEMICAL DISPOSAL

Chemical wastes are regulated by the Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act and its amendments.

Laboratory/studio supervisors will instruct employees/students on the proper procedure for collecting, identifying, and storing waste materials. When a sufficient quantity of hazardous waste has been collected, it will be picked up by a chemical waste handler and transported to an approved site for disposal.

For a more in-depth explanation of these procedures please see the Hazardous Waste Management Plan.

6.0 ENGINEERING CONTROLS

Chemical safety is accomplished by awareness of the chemical hazards and by keeping the chemical under control through a variety of engineered safeguards. Laboratory/studio personnel should be familiar with the proper use of those safeguards. All engineered controls must be properly maintained, inspected on a regular basis, and never overloaded beyond their design limits.

6.1 VENTILATION

Air flow in the laboratory/studio should be at a minimum of 20 linear feet per minute through each room. This gives workers comfortable breathing air.

However, the air flow should always be sufficient to prevent accumulation of chemical vapors. Work done with chemicals with low Threshold Level Values (TLVs) or high vapor pressures should be done in a fume hood.

Fume hoods should provide 60 to 100 linear feet per minute of air flow and be tested annually. When using a fume hood the worker should be aware that:

- The fume hood is a safety back up device to the condensers, traps, or other devices to trap and collect the flammable or toxic vapors.
- Propping entrance/exit doors (windows) open has a negative effect on the hood air flow. Doors to the lab should be closed.
- Fume hood shield should be lowered at all times except when adjusting the apparatus inside.
- The apparatus inside the hood should be kept towards the rear of the hood to prevent vapors from escaping.
- Chemicals should be placed 6-8 inches behind the sash.
- The design of the hood is usually for substances of specific characteristics (e.g., chemicals of low and high vapor density) respectively.
- Hoods are not storage areas. Unless specifically designated as a Satellite Accumulation Area.
- The vent ducts and fans must be kept clean and clear of obstructions.
- The hood must remain "on" at all times when a chemical is inside the hood, regardless whether any work is being done in the hood.
- Personnel should be aware of steps to take in case of power failure or other causes of hood failure.

6.2 SAFETY CANS

Flammable liquids should be kept in containers specifically designed for them. These containers should be used according to manufacturer instructions and common safety practices, including:

- The container must be kept closed except when adding or removing liquid.
- The flame arrestor screen must be kept in place at all times and replaced if punctured or damaged.
- As with all chemicals, material in safety cans must be stored in storage areas and not in laboratory/studio work areas or hallways.
- All flammables must be protected against sources of ignition.

6.3 FLAMMABLE STORAGE CABINETS

Cabinets designed for the safe storage of flammable materials can only be safe if used and maintained properly. Cabinets are generally made of double-walled construction and are made of 18-gauge steel. The doors are two inches above the base and the cabinet is liquid proof to that point. Two vents are provided on opposite sides of the cabinet and are equipped with flame arrestor screens.

Always read the manufacturer's information and follow some prudent safety practices, such as:

- Store only compatible materials inside the cabinet.
- Store chemicals of similar vapor density together when using mechanical ventilation (e.g., heavier than air vapors are vented through the bottom vent and lighter vapors through the top vent).
- Do not store paper or cardboard inside cabinets with the chemicals.
- Do not overload the cabinet.

6.4 EYEWASHES AND SAFETY SHOWERS

Whenever chemicals have the possibility of damaging the skin or eyes, an emergency supply of water must be available. All laboratories must be equipped with eyewashes and safety showers.

As with any safety equipment, these can only be useful if they can be used, therefore:

- Keep all passageways to the eyewash and shower clear of any obstacle (even a temporarily parked chemical cart).
- Eyewashes should be checked routinely (preferably weekly) to be certain that clean water flows through it.
- Showers should be checked routinely to be assured that access is not restricted and the start lever works.
- The flow through the safety showers should be tested periodically to ensure a flow of approximately 20-30 gallons per minute.

6.5 PROTECTIVE APPAREL

Some additional information about the use of protective clothing includes:

Gloves: must be of a material compatible with the chemical being used. Glove integrity should be checked before use and throughout the procedure.

Indirectly Vented Safety Splash Goggles: form a liquid proof seal around eyes and provide maximum splash protection from all angles.

They protect against liquid chemical splashes and provide adequate protection when working with chemicals that produce aerosols or form dust particles.

*There is no minimum liquid volume listed by EPA guidelines that is considered safe to use safety glasses.

Safety Glasses: Are rated for impact of flying projectiles.

Safety glasses are not considered a suitable substitute for safety splash goggles.

UV Safety Glasses: are specialty glasses used when working with UV light sources. Not all safety glasses have UV protection, make sure you are using properly rated safety glasses before proceeding. A UV shield may be used with the UV glasses to protect your facial skin. Make sure all other skin is covered when using UV sources.

Goggles w/ Face Shield: For more hazardous chemicals, UV exposure, corrosives, caustics, and hot chemicals, a face shield and goggles must be used together. The goggles protect the eyes in case a splash comes from the side or underneath the shield.

Laboratory Coat: Long sleeved coats offer the wearer minimal skin protection against minor splashes, allowing the chemical something to react with before the skin, and offering the victim time to remove the coat and shower.

Laboratory Coat and Apron: Adding a rubberized apron provides more time to react to the splash than just a coat alone. Arm guards should be worn when using an apron, if no lab coat is used.

6.6 RESPIRATORS

OSHA requires all employers to prevent atmospheric contamination. If vapor concentrations cannot be kept below regulated levels, then the employer will implement a written respirator program (see 29 CFR 1910.134). All personnel using respirators must be trained in their proper use and care. A person must be professionally fitted for respirator use.

6.7 VAPOR DETECTION

Odors are not to be used as the primary methods of vapor detection because odor thresholds can be greater than the Threshold Level Values. If suspicious odors are noticed the procedure should be stopped immediately and re-evaluated. The investigators should obtain mechanical vapor detectors, such as detector tubes or ionization meters, and respiratory protection. Contact CHO and/or Instructor immediately.

7.0 SPECIAL PROCEDURES FOR CARCINOGENS

OSHA has noted that many laboratory/studio workers use known or suspected carcinogens. While industrial workers might use only one or a limited few carcinogens, laboratory/studio workers are likely to use many such chemicals. Exposure to those carcinogens would at least have an additive impact on risk, if not synergistic. To limit the possible exposure, Beloit College has special procedures and precautions for work with carcinogens.

7.1 REGULATED AND CONTROLLED WORK AREAS

The storage areas for chemical carcinogens, will have restricted access. Signs warning "**Authorized Personnel Only**" will be posted at entrances to these work areas, and if necessary, the areas will be locked. Only personnel with special instruction on hazards and safe handling of carcinogens will be permitted access to these chemicals.

7.2 CLOSED SYSTEM PROTECTION

All work involving carcinogens must be done in a specially equipped closed systems to reduce the risks of employee exposure to the vapors. The closed systems include fume hoods, glove boxes, or similar devices.

7.3 HANDLING OF CONTAMINATED WASTE WATERS

Rinse water and other waste waters contaminated with carcinogens are to be collected for disposal. Specific disposal procedures will be outlined by Beloit College's Hazardous Waste Management Plan and will be consistent with RCRA.

7.4 PERSONAL HYGIENE

Laboratory/studio workers using carcinogens shall take extra precautions in maintaining good personal hygiene. In addition to hygiene practices under "Personal Hygiene" (section 4.2), workers will wash with decontamination cleaners before leaving the facility.

No food, beverage, or tobacco products will be permitted in the restricted areas.

7.5 PROTECTION OF VACUUM SYSTEMS

To protect vacuum lines and pumps use appropriate traps and guards; for example, use liquid nitrogen or dry ice-acetone traps on all vacuum pumps.

7.6 PROTECTIVE APPAREL

Personnel working in restricted areas should not wear any personal items such as jewelry which might be lost if decontamination is not possible. Use disposable clothing when possible. Use gloves and long sleeves at all times to prevent skin contact with the carcinogen.

7.7 ADDITIONAL PRECAUTIONS

When working with carcinogens, use the smallest amounts possible. Purchases of these chemicals should be restricted to the minimal amounts necessary to allow uninterrupted work.

8.0 RECORD KEEPING

Records of information, chemical inventories, and training provided under this plan must be provided to the College Chemical Hygiene Officer and the Safety & Compliance Officers for inclusion in a campus-wide database.

A set of the chemical Material Safety Data Sheets (MSDS) in paper format and the chemical inventory database is available from the Laboratory Coordinator and the College Chemical Hygiene Officer. The VelocityEHS/MSDSonline database, which contains all chemical products used on campus, is available through Facilities.

9.0 TRAINING

Each employee is required to have initial safety training and annual retraining the following areas as appropriate:

- 9.1 *Chemical Hygiene Plan:* All employees who handle hazardous chemicals will review the Beloit College Chemical Hygiene Plan with the CHO or designate at the time of initial employment and be retrained every five years.
- 9.2 *Hazard Communication Plan:* The Director of Personnel Services or designate will review this plan with each new employee. Retraining is required every five years.
- 9.3 *Fire Safety Training:* Training may be conducted by an appropriately trained individual and is recommended for all personnel serving in high risk areas. Retraining is required every five years. Training will be provided for other employees upon request.
- 9.4 *Hazardous Waste Management Plan:* Each employee handling or generating hazardous materials shall be shown how to read a Material Safety Data Sheet (MSDS) and chemical labels either by video or by the CHO. Retraining is required every five years. From the MSDS or CHO, the employee shall be responsible for:
 - learning details of handling, using, and properly disposing of hazardous chemicals, i.e., corrosives, oxidizers, reducers, flammables, air & water sensitive chemical, compounds posing health hazards;
 - detecting the presence of hazardous chemicals;
 - learning the potential physical and health hazards of chemicals in the work area;
 - learning to protect themselves with proper personal protective equipment;
 - learning the permissible exposure limits (PEL)
- 9.5 *DOT/Hazardous Material Shipping:* Individuals involved in the receiving, transport, packing, or shipping of Hazardous Materials must receive training provided by a DOT Certified individual from the institution. (typically, the CHO). Training procedures and frequency are defined in The Hazardous Materials Regulations or HMR and found in Parts 171 through 180 of Title 49, CFR

10.0 HAZARD IDENTIFICATION

- 10.1 Labels on incoming containers of hazardous chemicals must remain intact and not be defaced, hidden or covered.
- 10.2 MSDS sheets are available online and in the Science Center in file binders in the departments where exposure to hazardous material is likely.
- 10.3 Instructors shall provide training for students who could be exposed to hazardous chemicals that are produced for exclusive use in laboratories.
- 10.4 Chemical by-products of unknown composition produced in the laboratory/studio are assumed hazardous and are covered by this Chemical Hygiene Plan.
- 10.5 No chemicals may be produced for a user outside of Beloit College.
- 10.6 Each employee shall read the MSDS for each and every chemical before use. The employee shall note the permissible exposure limits (PEL) or recommended exposure limits for the chemical and noted signs and symptoms associated with exposure and over exposure to all hazardous chemicals.

Any chemical or chemical solution stored in any **secondary container** for more than six hours must be properly and legibly labeled with the minimum identification of: name, common name, owner, date, and hazard properties. Labels can be obtained from the Lab Coordinator.

PLEASE NOTE: It is the responsibility of each employee to investigate the potential health hazard of any chemical compound to which they might be exposed during the routine performance of their job. Consult the appropriate MSDS.

Implementation of the standards and procedures contained in this document is authorized by Beloit College and signifies compliance with the current OSHA regulations. All employees are required to abide faithfully by its direction and intent for their health and welfare and those of their fellow employees.

APPROVALS:

Chemical Hygiene Officer

Date

Laboratory and Safety Coordinator

Date

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