
# *Health & Safety Manual*

*Mechanical Engineering*

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# INTRODUCTION TO THE PROGRAM

British Columbia Institute of Technology (BCIT) is committed to conducting all activities in a manner that protects the health and safety of students. The institute endeavors to provide safe tools, materials, equipment, and processes for work and study by meeting regulatory requirements for occupational health and safety.

BCIT'S goals are to have an incident-free and healthy environment in which to work and learn. The Safety Manual outlines the Safety Management Program, which describes procedures for Institute and School safety practice related issues encountered in office and laboratory areas. The program is a guide. It is intended to supplement the Institute, municipal, provincial and federal legislation and regulations and other policies or regulations that may apply to the workplace and is not designed to replace them.

It is our policy to take all necessary steps to prevent injuries to students at our facilities. Students are expected to follow established safe work procedures and are encouraged to actively participate in making their own work environment safe and productive.

No safety program can be successful without the equal commitment of management, employees and students. New conditions are constantly arising and it is impossible to devise or list rules covering every situation that might occur. It is necessary, therefore, that each person accept individual responsibility to know his/her job, be alert, exercise good judgment and use common sense in order to perform his/her work in a safe manner.

# WORKPLACE SAFETY

## Overview

BCIT Engineering Programs' aim is to provide a safe, healthy and secure environment in which to work and learn. Appropriate preventative measures will be taken to eliminate hazardous conditions, accidents, injuries, occupational diseases and unnecessary or undue risks to personal security. Compliance with the Workers' Compensation Act of B.C., WHMIS, Institute Safety Program and related legislation is the minimal standard acceptable. As indicated, this program is a guide and is intended to supplement Institute policy and procedures. References are noted where applicable and shall be included in all review and orientation. These sections are provided as a summary of Institute policy. BCIT Occupational Health and Safety is governed by BCIT Policy 7150 (Occupational Health and Safety) and BCIT Policy 5102 (Student Code of Conduct). These policies can be accessed online at:

BCIT Policy 7150 OH&S

BCIT Policy 7150 OH&S

This policy applies to activities in the following laboratories:

- SW3-1990 -1990b Fluid Power Lab

- SW3-1985 PLC Lab
- SW9-115 Robotics Lab
- SW9-123 Electronics TTED Lab
- SW9-106 Machine Shop and Welding Lab
- SW9-107 Plastics Lab
- SW9-102 Automotive and Foundry Lab
- SW9-103 Wood Working Shop
- SW9-128/ Student Projects Lab

Hereafter, these laboratories will collectively be referred to as “Mechanical Labs.”

## Responsibilities

Safety is everyone’s responsibility. All levels of the BCIT Community have a role to play. Students should review the matrix of responsibilities, focusing on their role, and prior to attending labs at:

OH&S Matrix of Responsibilities

## Reporting Unsafe Conditions

When a student has reasonable cause to believe that the activity they are about to do would create undue hazard to the health or safety of any person, including themselves, they have the right and responsibility to report the circumstances of the unsafe condition to his/her instructor and/or Safety and Security.

The instructor will investigate the matter and ensure that any unsafe condition is remedied without delay or if in his/her opinion the report is not valid he/she shall inform the person who made the report.

It is expected that the student and instructors themselves will resolve most matters. If you cannot find a resolution to the issue, you must seek a resolution using the following steps:

Instructor ⟶ Program Head ⟶ Associate Dean ⟶ Dean

Students and instructors should report an unsafe condition using:

Report of Unsafe Condition

If the situation is immediately dangerous to life and health please, contact Safety and Security at 604-451-6856.

## INSPECTIONS

Safety inspections within a department are used to identify and control hazards in the workplace before incidents occur.

The school must ensure that formal and informal inspections are completed. Instructors encourage students to bring forward their observations of unsafe conditions on an ongoing basis. The school should always initiate prompt corrective action in response to valid concerns of students.

Inspections shall include, at a minimum, the following:

- Monthly safety committee inspections
- Visual inspection of equipment and area prior to student use

## ACCIDENT OR INCIDENT INVESTIGATIONS

Every incident that results in injury requiring medical treatment, or does not involve injury but has a potential for causing serious injury, must be investigated. The purpose of conducting an investigation is not to lay blame on anyone, but to determine the root cause(s) and prevent reoccurrence.

The principle investigator will be the supervisor or instructor. The instructor will complete the incident investigation report. The supervisor or instructor will be send an email from Safety, Security & Emergency Management (SSEM) to conduct the incident investigation.

Both the report form and instructions to complete the form can be accessed at:

Incident Investigation Report Forms

The goals of the investigation are to determine cause(s) of the incident and to identify any unsafe conditions, acts or procedures that contributed. Corrective action will be initiated without undue delay. The investigation will vary greatly depending on the type of accident, severity, number of people involved, etc.

## Forms

The following are brief descriptions of the report forms required for accident reporting or compensation.

### *Worker's Compensation Board Forms*

In order to receive compensation, workers injured at work must ensure that the proper forms are completed.
Incident Investigation Report Forms

### *Form 6A "Employee/student's Report of Injury"*

This is to be completed by the injured person if fit to do so. Another individual can complete the form for signature by the injured worker.

### *Form 6 "Application for Compensation and Report of Injury or Industrial Disease"*

This form is sent to the injured worker's home address by the Workers' Compensation Board. It should be completed by the injured worker and returned to the Workers' Compensation Board.

## Reportable Occurrences

The following occurrences must be reported immediately to Safety and Security and Worksafe BC-those occurrences that:

- Resulted in serious injury to or the death of a worker
- Involved a major structural failure or collapse of a building
- Involved the major release of a hazardous substance
- Involved in an incident required by regulation to be reported Student Education and Orientation

# STUDENT SAFETY EDUCATION AND ORIENTATION

## Employers' Responsibility

Under section 115(2) of the Works Compensation Act, an employer has the responsibility to ensure workers/students are made aware of all known or reasonably foreseeable hazards, as well as their rights and duties. Workers/students must be provided with the information, instruction, training, and supervision to ensure their health and safety. The School must establish orientation and training programs for workers under the WSBC OHSR 3.23. The objective of the program is to ensure that workers/students are able to apply the information to protect their own health and safety.

The orientation and training program will include:

- The name and contact information for the student's supervisor/instructor
- Mechanical labs' health and safety rules
- Hazards to which the student may be exposed
- Appropriate personal protective equipment
- Location of first aid facilities and means of summoning first aid and reporting illnesses and injuries
- Emergency procedures
- Instruction and demonstration of the student's work task or work process
- WHMIS information requirements

Additional training in respiratory care and use may be required dependent on hazard assessment.

## Students' Responsibility

All persons, while using BCIT's facilities, will conduct themselves in a safe and responsible manner and will adhere to all applicable safety and WorkSafe BC OHS regulations, policies, standard and guidelines.

Student duties and responsibilities are listed in BCIT Policy 7150 OH&S

In addition students are responsible for, not but no limited to the following:

- Students must attend health and safety training programs/orientations as instructed.
- Students must attend labs wearing the required PPE (see Personal Protective Equipment (PPE))
- Students are responsible for the cleanliness of their own work area

Students must adhere to the alcoholic beverages (7504-PR1), drugs (7200) and smoking (7150-PR4) policies: Safety and Security Policies and Procedures

These basic rules are supplemented by the specific lab/shop rules.

## WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

WHMIS is a comprehensive plan for providing information on the safe use of hazardous materials used in Canadian workplaces. Information is provided by means of product labels, material safety data sheets (MSDS) and education programs.

WCB requires instructors and students to be trained in WHMIS education (Regulation 5.6 and 5.7). These regulations apply to all employees (including students), working with hazardous products. WHMIS legislation provides employers, employees/students and suppliers nationwide with specific vital information about hazardous materials (controlled products).

BCIT's WHMIS Program includes the following elements:

- Student rights and responsibilities
- Controlled product labeling, which alerts workers/students to the identity and dangers of products and to the basic safety precautions
- Safety Data Sheets (SDS): technical bulletins which provide detailed hazard and precautionary information
- Education and training programs

All students that handle controlled products or work in close proximity must complete assigined WHMIS course.

BCIT will supply all SDS acquired from the suppliers to the appropriate lab locations and ensure they are readily available:

- At the lab locations where students may be exposed to the controlled product
- On the request of a worker or student

## Additional Notes and Guidelines

Follow any additional procedures or instructions provided by your instructor or Safety and Security for the safe use and handling of hazardous materials.

The amount of a hazardous substance in a work area should not exceed the amount reasonably required for the work in progress for the day.

Never store incompatible substances (consult SDS) in a manner that would allow them to mix in the case of container leakage or breakage.

Report any containers that are un-labeled or improperly labeled. Workplace labels must be affixed to controlled products that have been transferred from the original container into another container.

Supplier labels must be affixed to the original containers of controlled products. Labels cannot be removed, defaced, modified or altered. If labels are modified, missing or illegible, they should be replaced with workplace labels. Hazard pictograms can be found under the Resources tab on the site WHMIS 2015: At Work see:

Work Safe BC WHMIS

## LABORATORY SAFETY

Students must always work under the supervision of an instructor or AI (assistant instructor) when in the lab.

## Signage

Signage shall be posted near each major piece of equipment in the laboratory that lists:

- The PPE required when using the equipment
- Operational and pre-operational safety checks

All cabinets/drawers in a lab should be appropriately labeled. Safety signage will be posted throughout each laboratory and will be enforced without exception.

## Fire

Portable fire extinguishers are useful only if you know how to use them, if they are right for the type of fire you are fighting, and if the fire is discovered immediately. You shall not attempt to fight even a small fire until people have been evacuated from the area and the Fire Department has been called. Never attempt to fight a fire if any of the following is true:

- You are uncertain about how to use the extinguisher
- The fire is spreading beyond the immediate area where it started
- The fire could block your escape route
- You are alone.

Fire in other areas of the building: In the event of a fire alarm, exit quickly and calmly from the nearest exit, move away from the building and check in with your supervisor at the designated assembly area for the building.

Any fires must be reported to the Safety and Security office immediately.

Refer to the BCIT Burnaby Campus Emergency Preparedness and Response Guide (page 26) for further information on what to do in case of a fire on campus.

Emergency Preparedness and Response Guide

## Earthquake

In the event of an earthquake, take cover under sturdy furniture and hold on. If it is safe, stay where you are. After the earthquake, go to the designated assembly area. Watch for aftershocks. Emergency Response personnel will advise you further.

Refer to the BCIT Burnaby Campus Emergency Preparedness and Response Guide (page 16) for further information on what to do in case of an earthquake on campus.

Emergency Preparedness and Response Guide

## General guidelines for Laboratory Safety

### *Rules for Personal Safety*

Always follow the lab or shop rules, in addition to the shop-specific rules:

- Point out dangerous activities to your colleagues if you see them.
- Know where safety equipment (eyewash, extinguisher) is located and how to use it.
- Wash your hands after handling chemicals and before leaving the area.

- Act in a professional manner at all times.
- Escort all visitors and provide PPE if required.
- Be alert to unsafe conditions. It is the responsibility of each individual to assure a safe working environment for themselves and others in the laboratories.
- Consult the SDS sheets before working with any hazardous materials. Students must be familiar with the hazards of the materials with which they are working.
- Do not perform work if you are feeling tired or otherwise impaired.
- Do not carry out any work process that would create an undue hazard.
- Report all laboratory work accidents or near-misses to your instructor/FA/AI immediately.
- Report any hazardous conditions you may encounter in the lab to your instructor/FA/AI immediately.
- Report acts of violence, threatening, or abusive behavior if witnessed to your instructor/FA/AI immediately.

## Equipment

Do not use equipment you have not been trained to use. After training, refer to the Safe Operating Procedure (SOP) worksheets located near each piece of equipment for instructions on safety related instructions for a given piece of equipment.

## General Electrical Safety Principals

Electrical currents of a low amperage and voltage under certain circumstances may result in fatal shock. It is not voltage that kills but amperage. Voltages as low as 24-V AC can be a lethal threat. Low voltage DC circuits do not normally present a hazard to human life, although severe burns are possible. The time of contact with a live circuit affects the degree of damage, especially as far as burns are concerned.

Only persons qualified by training or experience should maintain electric or electronic equipment.

When handling electric wires, never use them as supports and never pull on live wires.

Any electrical failure or any evidence of undue heating of equipment should be reported immediately to the persons responsible for the area or equipment.

## EQUIPMENT SAFE WORK PROCEDURES/SAFE OPERATING PROCEDURES

Hazards present in lab areas are numerous. They include toxic or flammable chemicals, molten metal, rotating machinery, electrical equipment, tools, working at heights, welding and soldering. By identifying sources of hazards and following appropriate procedures, even activities of high potential risk can be engaged in safely.

Written and practical instructions reduce and control the hazards that are likely to be encountered in the workplace. Specific safe procedures with respect to the lab and lab area specific equipment, can be found at:
Safe Operating Procedures

## ERGONOMICS, BODY MECHANICS & MUSCULOSKELETAL INJURY PREVENTION

The purpose of ergonomics is to promote physical comfort, productivity and efficiency, resulting in a reduction in the risk of physical injury, stress and fatigue. Ergonomics includes the entire work environment, in all settings including manufacturing and office environments.

Musculosketal injuries happen as a result of working under conditions with repetitive or forceful use, improper ergonomics and/or improper body mechanics. These conditions cause injurious inflammation of muscles, tendons or bursa of the limbs and body of the person doing the work.

Following general work practices will help prevent musculoskeletal injuries.

- Practice good housekeeping.
- Pre-plan procedures to ensure the proper tools, equipment and number of personnel are available.
- Minimize the distance materials have to be moved - plan storage and movements properly.
- Store materials at or above hip height to minimize unnecessary bending.
- Break or divide heavy or large loads into smaller loads for easier transport.
- Use personal protective equipment such as kneepads, and gloves.
- Alternate activities if you have been assigned repetitive work.
- Where practicable, use dollies, hoists, forklifts or other equipment to do a job more efficiently.
- Take a minute to stretch/warm up before any repetitive or heavy lifting jobs.
- Do not attempt to lift objects that are obviously too heavy or bulky for one or which require getting into an awkward position. Get help.
- Be ready to lend a hand to fellow employees with lifting tasks.
- Ensure you have a firm grip on the object before lifting it, and ensure your hands and body is in the clear.
- Ensure that you have a clear view of your route when carrying materials.
- When lifting:
    - Keep your back as nearly upright as possible,
    - Use leg muscles instead of back or stomach muscles, and
    - Avoid twisting motions - turn with your feet.

# PERSONAL PROTECTIVE EQUIPMENT (PPE)

All PPE must meet applicable standards acceptable to provincial regulations. The minimum dress in the lab and lab areas includes safety glasses, long pants and CSA-approved green triangle steel-toed shoes.

Students will be educated on the reasoning for each piece of PPE and its limitations.

Supervisors/instructors will ensure that appropriate PPE is:

- Properly worn when required

Students who are required to use PPE will:

- Use the equipment in accordance with training and instruction
- Inspect the equipment before use
- Immediately report any damage or defective PPE to the site supervisor/instructor or designate

## Specific PPE Requirements

Students will adhere to all posted SOP and PPE requirements.

Clothing, which protects the body, is required. Bare legs (e.g. shorts, skirts or dresses) are not acceptable. Loose clothing is prohibited around rotating equipment. In certain labs, additional personal protective equipment, such as hardhat, gloves, shields, and high-visibility clothing, may be required. Labs that require the handling of molten metal will be provisioned with welding gear or aluminized safety clothing. Due to its flammability, synthetic clothing should be avoided in these high heat labs.

Hearing protection (muffs and/or plugs) is required in any lab location where there is noise of 85 dBA or greater and where your instructor determines hearing protection is necessary. All hearing protection must be selected, maintained and used in accordance with CSA Standard Z94.2-94 hearing protectors. Under most circumstances, hearing protection will be required when working in the vicinity of operating power equipment or tools. (To assist in determining noise levels, a rule of thumb is to clearly hear someone speaking where there is a background noise of 85 decibels; they could speak normally at 30 cm (1 foot) distance but would have to yell at 1.2 m (4 feet).

Eye protection, such as properly fitting goggles, face shields, or other eye protective equipment, must be worn when:

- Handling or being exposed to any material, which is likely to injure or irritate the eyes
- Engaging in any work in which there is a risk of eye injury
- Having 20/200 vision or being blind in either eye
- Working or passing through an area that the instructor or safety manager has designated as requiring such protection
- Wearing safety goggles over non-safety prescription glasses when an eye hazard exists

All eye protection equipment must meet CSA Standard CAN/CSA-Z94.3 standards.

Footwear: While in lab areas, students must wear CSA-approved green triangle steel-toed footwear to protect against molten metal as well as physical hazards associated with material handling.

Respirators: If a student is or might be exposed in a workplace to an air contaminant that exceeds an 8-hour TWA limit, ceiling limit or short-term exposure limit set by ACGIH for the air contamination, the student must wear the appropriate respirator which will be provided.

WorkSafeBC has additional information and documents see:

Eye and Face Protective Equipment

Safety Footwear

## HAND TOOLS

Hand tools may only be used by authorized persons. A person must not be authorized to use a hand tool until the person has been adequately instructed and trained, and has demonstrated an ability to safely use it.

General Guidelines for Hand Tool Use

- Don't use tools for jobs they are not intended for; there is an appropriate tool for every job.
- Don't apply excessive pressure on tools.
- Hand tools create exposure too many hazards, including falling, flying and abrasive objects, harmful dusts, fumes, mists, vapours and/or gases. Wear appropriate PPE for all applicable exposures (safety glasses, gloves, and respirator).
- Maintain tools carefully, keep them clean and dry, and store them properly after use. Inspect tools for defects prior to use.
- Any damaged tool must be identified as unsafe and removed from service until the tool has been replaced or refurbished to an appropriate working condition.
- Exercise extreme caution when using tools near live electrical circuits. Do not use cushion grip handles as a replacement for insulated handles.
- Pull on wrenches and pliers. Never push unless you are using an open hand. Face adjustable wrenches forward, and turn wrench so pressure is against the permanent jaw.
- Don't increase leverage by adding sleeves to increase tool length; there is an appropriate tool for every job.
- Don't cut or chip towards yourself when using cutting tools or chisels.
- Do not use one hammer to strike another.

## POWER TOOLS

Power tools may only be used by authorized persons. A person must not be authorized to operate a hand tool unless the person has been adequately instructed and trained, and has demonstrated an ability to safely operate it.

All rules that apply to the hand tools section apply in addition to this section.

Power hand tools must meet standards (CSA, etc.) acceptable to the WCB.

General Guidelines for Power Tool Use:

- Inspect tools, power cords and electrical fittings for damage prior to each use. Repair or remove from service and replace damaged equipment.
- Ensure all belt and pinch point guards are in place and functioning.
- Do not wear gloves, loose clothing or jewelry while using revolving/rotating power tools.
- Switch tools off before connecting them to a power supply.
- Do not use electric tools in wet or damp locations without a Ground Fault Circuit Interrupter (GFCI).
- Ensure tools are properly grounded (3-prong plug) or are double insulated.
- Keep power cords clear of tools during use.
- Do not carry electrical tools by the power cord.
- Avoid octopus (overloaded) connections.
- Wear approved safety glasses or goggles when using power tools for grinding, cutting and sanding operations.
- If a guard on machinery is impracticable for a specific operation it may be removed, but an appropriate device must be used to prevent hands entering the cutting area. Guards must be replaced upon completion of the operation.
- Ensure all guards and shields are in good working order and in place prior to any equipment operation.

Note: Please refer to Safe Work Procedure/Safe Operating Procedures for full details on operating, maintaining and using equipment.

## HOUSEKEEPING

- Lab areas must be kept clean and free from obstructions at all times. Tools, loose objects, oil, grease and other materials left lying about are hazards.
- Tidy your lab area at the end of the lab, and/or immediately after finishing a job, and as necessary.
- Clean up any sizeable spills of toxic, flammable or corrosive materials immediately, using the method described in the appropriate Safety Data Sheet (SDS) or on the container label. Report large spills of such materials to your supervisor/instructor.
- All students must help to keep work sites clean and free of tripping/slipping hazards by depositing refuse in designated containers.
- Do not store materials, tools and equipment in stairways, corridors, catwalks, ramps, passageways, and exits. Materials stored overhead must be protected against falling into work areas.
- Dispose of broken glass and other sharps materials in designated trash containers.
- Properly stack and secure all material to prevent sliding, falling or collapse.
- Stack and store all materials in a manner that permits safe access to and from a work area.
- In order to ensure housekeeping is maintained, site inspections include housekeeping components.