

APPENDIX A

EXPOSURE CONTROL PLAN FOR

DESIGNATED SUBSTANCES

(WELDING)



Contents

1. Purpose	3
2. Roles & Responsibilities	3
2.1 Supervisor/Instructor	3
2.2 Chief Instructor	3
2.3 Facilities Maintenance	4
2.4 Housekeeping.....	4
3. Risk Identification, Assessment & Control	4
3.1 Risk Identification.....	4
3.2 Risk Assessment	4
3.3 Control Measures	6
4. Program Review	7



1. Purpose

This Exposure Control Plan is designed to minimize employee, student, contractor, and visitor exposure to designated substances in the BCIT Welding Program (NE08) and to ensure compliance with applicable WorkSafeBC regulations.

This document is an appendix to the BCIT Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan. This document is not a stand-alone Exposure Control Plan, but builds upon the BCIT Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan to give specific details of controlling the potential for exposure to designated substances in the NE08 building.

2. Roles & Responsibilities

Please see the BCIT Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan for the general roles and responsibilities at BCIT for controlling exposures to designated substances at BCIT.

2.1 Supervisor/Instructor

In addition to the roles and responsibilities that are outlined in the BCIT Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan, Supervisors/Instructors in NE08 are responsible for:

- Conducting risk assessment for welding activities
- Development of specific safe work procedures for any welding activities
- Ensuring that end-of-shift cleaning is performed
- Education of employees and students regarding: health hazards associated with welding, the BCIT Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan, control measures, and work procedures
- Ensure that all students are trained per BCIT Orientation and Training procedures and the BCIT Welding Program Orientation
- Perform ongoing inspections and maintaining sufficient supervision to ensure:
 1. All employees and students are using the appropriate levels of control while performing welding and grinding activities in NE08
 2. Exposure controls that are outlined in safe work procedures and the BCIT Reproductive Toxins, Sensitizers and Carcinogens Exposure Control Plan are followed
 3. Personal Protective Equipment (PPE) provided is used, and that local ventilation and hygiene facilities are effectively operated, as necessary
 4. Additional corrections and controls are implemented as hazards are reported
- Ensure that accidents/incidents are reported and investigated
- Consult with, or report to the OHS Group, and the Joint OHS Committee when necessary

2.2 Chief Instructor

The Chief Instructor is responsible for:

- Daily safety inspection of the NE08 building

- Conducting a bi-weekly safety meeting with all instructors
- Ensuring Supervisors/Instructors show due diligence

2.3 Facilities Maintenance

Facilities Maintenance is responsible for:

- Ensuring that the ventilation system is operational
- Conducting PM work as required to ensure that ventilation system is within design parameters

2.4 Housekeeping

The Custodial Group is responsible for performing regular (weekly) clean up in order to prevent accumulation of welding debris in NE08.

3. Risk Identification, Assessment & Control

3.1 Risk Identification

The process of welding produces gases and fumes that can be hazardous. The health hazard that is associated with the process is dependent upon the relative toxicity of the substances being used (type of welding and materials), the duration of exposure and the intensity of exposure.

Excerpt from WorkSafeBC OHS Guidelines 5.48-5 Welding Fume

Welding fume composition

Establishing a worker's exposure to hazardous substances in welding fumes is not a simple matter since this depends on the material being welded as well as the process and electrodes used. Welding fumes may contain fluoride, and metals or oxides of metals such as aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, iron, lead, manganese, nickel, silver, tin, titanium, vanadium and zinc.

Apart from welding fumes, hazardous levels of gases, including carbon monoxide, oxides of nitrogen, or ozone may also be present during welding. In addition, there may be a risk of asphyxiation when shielding gases such as argon are used, particularly in an enclosed or confined space. Decomposition products such as phosgene can form when coatings or residues on or near the object being welded are heated.

Ongoing walk through inspections will be conducted by instructors to identify those areas where there is the potential for exposure to welding gases/fumes. Chief instructors will conduct daily inspections to ensure that potential hazards are identified promptly and corrected immediately. The daily inspections will be documented, posted in the area, and stored following BCIT policy.

3.2 Risk Assessment

Risk assessments shall be conducted by Welding Instructors in consultation with the Welding Chief Instructor and BCIT OHS Group for any processes that could lead to Welding Fume exposure in order to determine the potential consequences of hazards and what controls need to be implemented to mitigate exposures. The following table provides a general outline hazardous components that may be present as a result of welding processes.

Health Effects of Welding Fumes, Gases and Organic Vapours Produced During Welding (Source: Work Safe Alberta Workplace Health & Safety Bulletin CH032-Chemical Hazards)	
Aluminum Aluminum component of some alloys, e.g., Inconels, copper, zinc, steel, magnesium, brass and filler materials.	Respiratory irritant.
Beryllium Hardening agent found in copper, magnesium, aluminum alloys and electrical contacts.	“Metal Fume Fever.” A carcinogen. Other chronic effects include damage to the respiratory tract.
Cadmium Oxides Stainless steel containing cadmium or plated materials, zinc alloy.	Irritation of respiratory system, sore and dry throat, chest pain and breathing difficulty. Chronic effects include kidney damage and emphysema. Suspected carcinogen.
Chromium Most stainless-steel and high-alloy materials, welding rods. Also used as plating material.	Increased risk of lung cancer. Some individuals may develop skin irritation. Some forms are carcinogens (hexavalent chromium).
Copper Alloys such as Monel, brass, bronze. Also some welding rods.	Acute effects include irritation of the eyes, nose and throat, nausea and “Metal Fume Fever.”
Fluorides Common electrode coating and flux material for both low- and high-alloy steels.	Acute effect is irritation of the eyes, nose and throat. Long-term exposures may result in bone and joint problems. Chronic effects also include excess fluid in the lungs.
Iron Oxide The major contaminant in all iron or steel welding processes.	Siderosis – a benign form of lung disease caused by particles deposited in the lungs. Acute symptoms include irritation of the nose and lungs. Tends to clear up when exposure stops.
Lead Solder, brass and bronze alloys, primer/coating on steels.	Chronic effects to nervous system, kidneys, digestive system and mental capacity. Can cause lead poisoning.
Manganese Most welding processes, especially high-tensile steels.	“Metal Fume Fever.” Chronic effects may include central nervous system problems.
Molybdenum Steel alloys, iron, stainless steel, nickel alloys.	Acute effects are eye, nose and throat irritation, and shortness of breath.
Nickel Stainless steel, Inconel, Monel, Hastelloy and other high-alloy materials, welding rods and plated steel.	Acute effect is irritation of the eyes, nose and throat. Increased cancer risk has been noted in occupations other than welding. Also associated with dermatitis and lung problems.
Vanadium Some steel alloys, iron, stainless steel, nickel alloys.	Acute effect is irritation of the eyes, skin and respiratory tract. Chronic effects include bronchitis, retinitis, fluid in the lungs and pneumonia.
Zinc Oxides Galvanized and painted metal.	“Metal Fume Fever.”
Carbon Monoxide Formed in the arc	Absorbed readily into the bloodstream, causing headaches, dizziness or muscular weakness. High concentrations may result in unconsciousness and death.
Hydrogen Fluoride Decomposition of rod coatings.	Irritating to the eyes and respiratory tract. Overexposure can cause lung, kidney, bone and liver damage. Chronic exposure can result in chronic

	irritation of the nose, throat and bronchi.
Nitrogen Oxide Formed in the arc.	Eye, nose and throat irritation in low concentrations. Abnormal fluid in the lung and other serious effects at higher concentrations. Chronic effects include lung problems such as emphysema.
Oxygen Deficiency Welding in confined spaces, and air displacement by shielding gas.	Dizziness, mental confusion, asphyxiation and death.
Ozone Formed in the welding arc, especially during plasma-arc, MIG and TIG processes.	Acute effects include fluid in the lungs and hemorrhaging. Very low concentrations (e.g., one part per million) cause headaches and dryness of the eyes. Chronic effects include significant changes in lung function.
Aldehydes Metal coating with binders and pigments. Degreasing solvents.	Irritant to eyes and respiratory tract.
Di-isocyanates Metal with polyurethane paint	Eye, nose and throat irritation. High possibility of sensitization, producing asthmatic or other allergic symptoms, even at very low exposures.
Phosgene Metal with residual degreasing solvents. (Phosgene is formed by reaction of the solvent and welding radiation.)	Severe irritant to eyes, nose and respiratory system. Symptoms may be delayed.
Phosphine Metal coated with rust inhibitors. (Phosphine is formed by reaction of the rust inhibitor with welding radiation.)	Irritant to eyes and respiratory system, can damage kidneys and other organs.

3.3 Control Measures

Elimination & Substitution

Whenever practical, materials with lower associated hazards should be used.

Engineering Controls

Local exhaust ventilation must be used to control welding fume exposure and dispersion into the general work area. Extraction units must be effective in removing the welding fume at the source and must be positioned in such a way that they do not pull the welding fume through the employees/students' breathing zone.

NOTE: General dilution ventilation shall not be used **alone** to control welding fume.

Administrative Controls

Administrative controls include:

- Instructors will conduct ongoing inspections of the NE08 work areas
- The Chief Instructor will conduct and document a daily inspection of NE08
- The Chief Instructor will conduct a bi-weekly safety meeting with all instructors

- Facilities Maintenance will perform PM work to ensure that ventilation systems are within design parameters
- No eating or smoking is allowed in the NE08 work areas
- Pressurized blowing shall not be used to clean debris from equipment, workshop surfaces or any PPE
- Prompt corrections and control of any identified or reported hazards
- Education of employees/students regarding the hazards of, and the control measures to prevent, exposure to welding fume

Personal Protective Equipment

PPE required during work that has the potential for welding fume must be available and used. PPE for welding and grinding activities in NE08 includes, but is not limited to respirators, welding helmets, goggles/safety glasses with side shields, gloves, safety footwear, leathers and coveralls.

- Training on PPE use, maintenance, and limitations must be provided by the Welding Department
- All students and employees must use appropriate respiratory protection during welding processing where local exhaust ventilation is unavailable or insufficient to prevent exposure of student/employee to welding fume
- If respirators are required, then fit tests must be performed per the BCIT Respiratory Protection Program (BCIT Safety Manual Part 3- Section 42)

4. Program Review

This appendix will be reviewed annually for the following:

- The effectiveness of control measures and work procedures used
- First aid reports and any reported exposure related health issues
- Documentation for training and education

The annual review will be done in consultation with the NE08 Advisory Occupational Health and Safety Committee.