Studio Arts Chemical Safety Guidelines

Students, faculty members, technicians and visitors working in Concordia University studios or workshops with artist materials must be aware of the hazards associated with arts supplies and equipment. They must know where to obtain more information on the products they use, how to interpret this information, how to protect themselves and how to properly dispose of hazardous waste materials.

Even though work involving visual arts materials should cause no concern for health or safety, there are risks associated with a few of the arts materials themselves, such as pigments, paints, solvents and solid materials such wood or stone. These guidelines describe possible risks associated with some arts materials and how such risks can be minimized.

Chemical Safety Training

Safety is the responsibility of everyone at Concordia University. The Faculty of Fine Arts collaborates closely with Concordia's Environmental Health & Safety (EHS) office by providing a safety seminar for Fine Arts faculty, staff and graduate students.

A new version of the WHMIS for Fine Arts training is provided in person by EHS personnel. This safety training notably includes a section related to specific activities that normally take place in Fine Arts studios and workshops at Concordia University. This training is intended to be adapted to anyone directly working with chemicals in the course of artistic activities, or in areas where chemicals are being stored, used, and disposed.

People can register for live sessions of *WHMIS 1988 & 2015 for Fine Arts* training from the EHS website (http://www.concordia.ca/campus-life/safety/training.html#calendar). The corresponding online session on moodle will be soon available as well. The current online *WHMIS 1988 for Fine Arts* session can be attended from moodle and should be completed with the information provided in the Safety Guidelines for Fine Arts Students Working From Home, along with the present document.

Furthermore, people who are responsible for the management of the hazardous waste resulting from the workshop/studio activities must consult Concordia Hazardous Waste Disposal Procedures to ensure that any hazardous waste generated at the University is disposed of properly in order to protect the public and the environment. The related considerations are discussed in the new *WHMIS 1988 & 2015 for Fine Arts* training.

Contact: hazardouswaste@concordia.ca for any question or inquiry regarding hazardous waste disposal.

Chemical Hazards

Workplace Hazardous Materials Information System – WHMIS 1988 and WHMIS 2015

WHMIS stands for Workplace Hazardous Materials Information System. It is a comprehensive plan for providing information on the safe use of hazardous materials in Canadian workplaces. WHMIS 1988 was created in response to the Canadian workers' right to know about the safety and health hazards that may be associated with the hazardous materials or chemicals they use at work.

The ***Globally Harmonized System of Classification and Labelling of Chemicals (GHS)*** was adopted by the UN Economic and Social Council (ECOSOC) in July 2003. The purpose of this system is to regroup all existing hazard communication systems on chemicals in order to develop a single, globally harmonized system. Accordingly, the classification of chemicals is addressed according to their hazards and the related information is communicated through labels, Safety Data Sheets (SDS), and education programs (e.g. training). On February 11, 2015, the Canadian Government published the Hazardous Products Regulations (HPR, SOR/2015-17), repealing at the same time the former Controlled Products. The new HPR modified WHMIS 1988 to incorporate the features from GHS for workplace chemicals.This modified WHMIS is referred to as **WHMIS 2015**.

The alignment with the GHS offers many benefits including the implementation of a more comprehensive hazard classification criteria based on physical and health hazards, the definition of new hazard classes, an harmonization in the information displayed on labels and in SDS, for which the most recent format is internationally standardized.

The change to WHMIS 2015 specifically involved new standardized:

- Classification rules and hazard classes based on two (2) distinctive groups:
  - the physical hazards group,
  - the health hazards group. *Environment hazards* are *not proposed to be adopted in Canada under WHMIS.*
- Format for Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets)
- Label requirements:
  - new hazard symbols/pictograms,
  - signal words (*Danger* and *Warning*),
  - hazard statements,
  - precautionary statements.

All suppliers, employers and employees are expected to comply with WHMIS 2015 since December 1st, 2018 (details can be obtained from Health Canada WHMIS Transition web page). Nevertheless, both old and new systems may continue to co-exist at Concordia University during a transition period, and more particularly in the workshops and studios where hazardous artist materials are used, stored and disposed.

The complete WHMIS-related compliant information about a hazardous chemical is provided in its SDS. This document can be provided by the supplier, or retrieved by the users to furnish detailed information about the hazards and the safe use of the product or the material.

Before using any product for the first time, students and staff must retrieve the corresponding SDS and should review the related information.

The following tables indicate former symbols and new WHMIS pictograms associated with the different hazard classes.

WHMIS 1988 Classification of Materials

The WHMIS 1988 legislation distinguishes six (6) classes of controlled materials with defined chemical hazards associated with each class. Certain arts materials are included in one class or more, with the potential of having several chemical hazards associated with them.

Pictogram	Classes	Definition	*Examples*
	**A – COMPRESSED GAS**	Products held under pressure	*Propane* *Butane* *Acetylene* *Cryogens*
	**B – FLAMMABLE AND COMBUSTIBLE MATERIAL** B1 Flammable gases B2 Flammable liquids B3 Combustible liquids B4 Flammable solids B5 Flammable aerosols B6 Reactive flammable materials	Products that will burn or catch on fire easily	*Acetone* *Toluene* *Paint thinner* *Varnish* *Varsol* *Spray paint* *Oily rags*
	**C – OXIDIZING MATERIAL**	Products that can cause or promote combustion of another material (whether or not they are themselves combustible) or products that are organic peroxides	*Peroxides* *Nitric acid* *Javel* *Nitrates*
	**D1 – POISONOUS AND INFECTIOUS MATERIAL (causing immediate and serious effects)**	Products that can rapidly cause harmful health effects, including death	*Pigments* *Paints/varnishes* *Solvents* *Turpentine*
	**D2 – POISONOUS AND INFECTIOUS MATERIAL (causing other toxic effects)**	Products whose health effects generally appear over time following one or several exposures	*Silica dust* *Wood dust* *Developers* *Accelerators*
	**D3 – POISONOUS AND INFECTIOUS MATERIAL (Biohazard ous infectious materials)**	Living organisms or their toxins that can cause disease in people or animals	*Blood* *Cells* *Bacteria*
	**E – CORROSIVE MATERIAL**	Products that can corrode metal surfaces or cause burns to skin and eyes	*Acetic acid* *Film developers* *Ferric chloride* *Javel*
	**F – DANGEROUSLY REACTIVE MATERIAL**	Products that can undergo decomposition, polymerization or become self-reactive under certain conditions (pressure, temperature, shock, violent reaction with water/air)	*Epoxys* *Peroxides*

WHMIS 2015 Hazard Pictograms & Classes

WHMIS 2015 applies to two (2) major groups of hazards: physical and health. Each hazard group includes hazard classes (19 for the physical hazards group and 12 for the health hazards group) that have specific hazardous properties.

Pictogram	Classes	Example of Risks	Example of Safe Handling Procedures
	• **GASES UNDER PRESSURE**	**MATERIALS WHICH ARE NORMALLY GASEOUS, KEPT IN A PRESSURIZED CONTAINER** ✓May explode if heated, punctured or dropped	**ENSURE CONTAINER IS ALWAYS SECURED** ✓Store in appropriate designated areas ✓Do not drop or allow to fall ✓Protect from mechanical damage
	• **FLAMMABLE** • **SELF-REACTIVE** • **PYROPHORIC** • **SELF-HEATING** • **IN CONTACT WITH WATER EMITS FLAMMABLE GAS** • **ORGANIC PEROXIDE**	**MATERIALS WHICH WILL CONTINUE TO BURN AFTER BEING EXPOSED TO A FLAME OR OTHER IGNITION SOURCE** ✓May be ignited if exposed to heat, sparks, friction, flames or incompatible materials	**STORE IN PROPERLY DESIGNATED AREAS** ✓Keep away from heat, hot surfaces, sparks, open flames and other ignition sources ✓Store in a well-ventilated, cool place
	• **OXIDIZING GASES, LIQUIDS AND SOLIDS**	**MATERIALS WHICH CAN CAUSE OTHER MATERIALS TO BURN OR SUPPORT COMBUSTION** ✓Can provide Oxygen which enables burning or explosion ✓Can increase the intensity of a fire ✓Can transform combustible into flammable	**STORE IN AREAS AWAY FROM FLAMMABLES/COMBUSTIBLES IN WELL-VENTILATED COOL PLACE** ✓Store in proper containers which will not rust or oxidize ✓Keep away from heat, hot surfaces, sparks ✓Keep valves and fittings free from oil and grease
	• **ACUTE TOXICITY (harmful)** • **SKIN AND/OR EYE IRRITANT** • **SKIN SENSITIZER** • **SPECIFIC TARGET ORGAN TOXICITY (STOT) – Single exposure (Cat. 3)** • **HAZARDOUS TO THE OZONE LAYER***	**POISONOUS MATERIALS WHICH CAUSE IMMEDIATE AND SEVERE HARM** ✓Defines the less hazardous situations for the classes of: 1) Acute toxicity (harmful), 2) Chronic toxicity (STOT-Single exposure and skin/respiratory sensitization) 3) Skin/eye corrosion or irritation	**AVOID BREATHING DUST OR VAPOURS** **AVOID CONTACT WITH SKIN OR EYES** ✓Wear Personal Protective Equipment (PPE) which is effective for exposure situation ✓Work in well-ventilated areas ✓Wash potentially exposed body parts thoroughly after handling
	• **CARCINOGENICITY** • **GERM CELL MUTAGENICITY** • **REPRODUCTIVE TOXICITY** • **RESPIRATORY SENSITIZATION** • **STOT – Repeated and Single exposure (Cat. 1&2)** • **ASPIRATION HAZARD**	**MATERIALS WHICH CAN CAUSE OR SUSPECTED OF CAUSING SERIOUS LONG TERM HEALTH EFFECTS**	**WORK IN A WELL-VENTILATED AREA** ✓Store in appropriate designated areas ✓Avoid direct contact ✓Use appropriate PPE ✓Obtain and learn special instructions/controls before use ✓Avoid repeated and/or prolonged exposure situations

	• **ACUTE TOXICITY (Severe: Fatal and Toxic)**	**MATERIALS WHICH CAN CAUSE TOXICITY OR DEATH EVEN IN SMALL QUANTITIES** ✓Adverse health effects or death following a brief oral, dermal or inhalation exposure within 4 to 24h	**MATERIALS WHICH CAN CAUSE TOXICITY OR DEATH EVEN IN SMALL QUANTITIES** ✓Wear appropriate PPE ✓Work in well-ventilated area ✓Follow manufacturer's use, handling, storage, and disposal instructions to prevent exposure and adverse health effects
	• **SERIOUS EYE DAMAGE** • **SKIN CORROSION** • **CORROSIVE TO METALS**	**MATERIALS WHICH REACT WITH METALS AND LIVING TISSUES** ✓Skin corrosion/burns ✓Serious eye damage ✓Can generate heat, flammable gas, toxicity, reactivity when in contact with other materials	**USE APPROPRIATE STORAGE CONTAINERS AND ENSURE PROPER NON VENTING CLOSURE** ✓Wear appropriate PPE (respiratory protection, apron, thick gloves) ✓Minimize handling and quantity of corrosives ✓Always add corrosive to water and not the other way round
	• **SELF-REACTIVE (severe)** • **ORGANIC PEROXIDES** • **EXPLOSIVES***	**MATERIALS WHICH MAY EXPLODE DUE TO REACTION TO FIRE, SHOCK, FRICTION, HEAT, PUNCTURE, OR INCOMPATIBLE MATERIAL** ✓Sensitive to sunlight ✓Sensitive to contamination with incompatible materials ✓Different types for different hazardous situations ✓Flame pictogram can be associated	**HANDLE WITH CARE AVOIDING VIBRATION, SHOCKS AND SUDDEN TEMPERATURE CHANGES** ✓Store in appropriate containers ✓Ensure storage containers are sealed ✓Store and work in designated areas
	• **BIOHAZARDOUS INFECTIOUS MATERIALS**	**INFECTIOUS AGENTS OR BIOLOGICAL TOXIN CAUSING SERIOUS DISEASE OR DEATH** ✓May cause anaphylactic shock ✓Includes exposure to viruses, yeasts, molds, bacteria, parasites which may cause disease in animals or humans	**FOLLOW SAFE LABORATORY PRACTICES AND PROCEDURES** ✓Avoid forming aerosols and breathing vapours ✓Store only in special designated areas with limited access and appropriate engineering controls (BSC, fume hoods) ✓Follow routine practices such as hand hygiene and glove use
No pictogram	• **COMBUSTIBLE DUSTS** • **SIMPLE ASPHYXIANT** • **HHNOC and PHNOC** • **Some less severe hazard categories**	**MAY CAUSE UNCONSCIOUSNESS OR DEATH BY SUFFOCATION** ✓Risk of dust explosion or exposure	**DO NOT USE WITHOUT UNDERSTANDING THE HAZARD** ✓Apply appropriate controls
	• **HAZARDOUS TO THE AQUATIC ENVIRONMENT***	**MAY BE HARMFUL TO AQUATIC LIFE OR CAUSE LONG-LASTING EFFECTS TO THE AQUATIC ENVIRONMENT**	**USE PRODUCT ACCORDING TO DIRECTIONS** ✓Avoid release to the natural environment ✓Dispose in accordance with all regulatory requirements and obligations

The environmental, ozone layer and explosives hazard classes are not covered under WHMIS 2015.

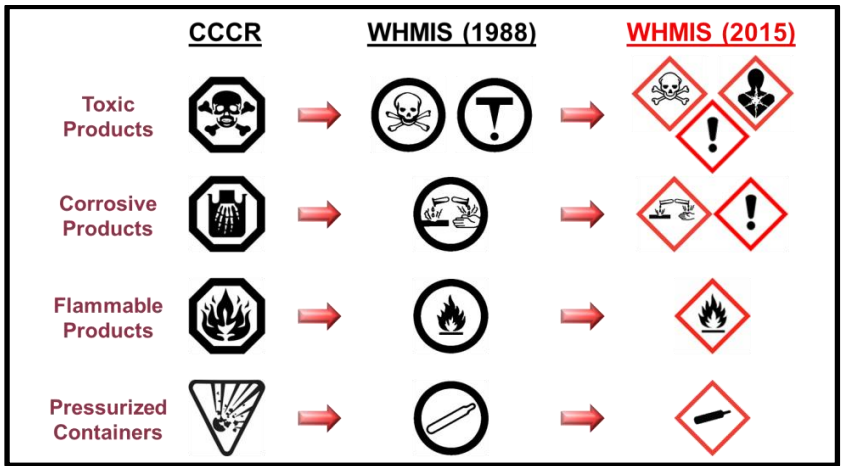
Consumer Controlled Products Classification

If arts materials are bought in Canada through a retail store/outlet network (e.g. Rona, Canadian Tire…), then that product must meet the requirements of the *Consumer Chemicals and Containers Regulations (CCCR), 2001*, which initial purpose is to inform consumers about the hazards of chemicals and containers for personal use and for use around the household. Therefore different CCCR hazards pictograms can be displayed on the containers, and often in the form of a combination of two or three graphical elements.

Even though different symbols or pictograms are used, these arts materials are to be considered as hazardous as those who bear WHMIS labels. Equivalent precautions must be taken.

Pictogram	Classes	Definition	Precautions	*Examples*
	• **TOXIC PRODUCTS**	**POISONOUS** – May be lethal or cause serious or irreversible health effects.	✓Do not get in eyes or on skin ✓Do not breathe fumes ✓Wear PPE as indicated on the label	*Paints* *Varnishes* *Acetone* *Solvents*
	• **CORROSIVE PRODUCTS**	**CAUSE BURNS** – Cause chemical burns to the skin, eyes and lungs. May form dangerous fumes when mixed with other chemicals.	✓Do not mix with other chemicals ✓Do not get in eyes or on skin ✓Do not breathe fumes ✓Do not swallow ✓Wear PPE as indicated on the label	*Javel* *Muriatic acid* *Acetic acid* *Household cleaners (drain cleaners)*
	• **FLAMMABLE PRODUCTS**	**FIRE HAZARD** – May ignite when exposed to spark or flame or spontaneously ignite.	✓Use in well-ventilated areas ✓Keep away from flames and objects that spark ✓Store in a safe location ✓Read the specific instructions on the label	*Paints* *Aerosols* *Varnishes* *Solvents (Varsol, Isopar K®)*
	• **PRESSURIZED CONTAINERS**	**EXPLOSION HAZARD** – Under pressure. May explode when heated or punctured.	✓Do not puncture ✓Do not burn ✓Store away from heat	*Spray paint* *Aerosols*
No pictogram	• **QUICK SKIN-BONDING ADHESIVES**	**BONDS SKIN INSTANTLY**	✓Do not get in eyes or on skin	*Super glue* *Adhesives*

The approximate equivalence between the different systems is provided in the figure below.



How Chemicals Enter the Body?

Inhalation

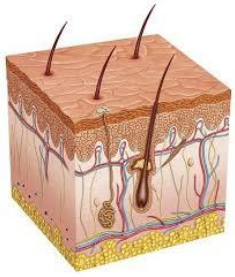
This is the major route of entry for airborne chemicals (dust, mist, vapors). The chemicals can have a direct effect on the nose, upper respiratory tract and the lungs or they can enter the blood stream and thus affect the blood, bones, heart, brain, liver, kidneys or bladder.

Ingestion

This is not normally a direct route of entry from exposure except by wilful or accidental ingestion. Materials can also enter the stomach through indirect means. For example, the lung has a cleaning mechanism which pushes material out of the lung where it can be swallowed. This can result in an exposure to most of the internal organs or even in a local action on the stomach wall.

Direct mouth contact with contaminated hands while eating or drinking can also lead to involuntary ingestion of hazardous materials.

Skin Contact



Some materials are absorbed through the skin and therefore, when they enter the bloodstream, they can be transported throughout the body and accumulate in, or affect, the most sensitive areas of the body. Skin contact can also result in allergic reaction, the removal of the protective skin oil, or dermatitis. In some cases, the chemical contact may result in a cancerous lesion. The use of certain solvents such as acetone can also be responsible for the enhancement of the permeability of the skin barrier (compromised or not).

Subcutaneous contamination

Unintended localised skin punctures or cuts can occur with sharps or needles and can promote subcutaneous contamination.

Potential Health Effects of Chemicals

Acute Effect

An acute effect is a reaction that happens immediately or quickly after someone is exposed to a harmful material. It is usually obvious. If it is not serious, an acute effect is generally reversed after the cause is removed; however, some acute effects can be very serious.

Chronic Effect

A chronic effect usually results from prolonged or repeated exposure to relatively small amounts of a harmful substance. Chronic effects may not appear until months or years after the start of exposure (and for this reason their cause can be hard to identify). An example may include brain damage resulting from years of exposure to low concentrations of lead.

Reproductive Health Effects

Many arts materials used can also affect the reproductive system. Some chemicals have specific effects on the male reproductive system (e.g. cadmium, manganese, and lead) while others are more specific for the female reproductive system (e.g. toluene and xylene which cause menstrual irregularities).

Pregnant and Breast-Feeding Women

Certain chemicals are known to cross the placental barrier and possibly cause damage and birth defects (e.g. lead, cadmium, mercury, copper, carbon monoxide, dyes and many organic solvents). Also, many chemicals, especially those containing heavy metals (e.g. lead, mercury, cadmium, copper) and solvents (e.g. xylene, acetone, toluene), can be found in a woman's milk several hours after exposure and can affect the infant.

Some Materials Used in Arts

Solvents

Solvents are defined as liquids that can dissolve other substances. They are used in many arts techniques, either as part of the art material itself (such as paints, inks, thinners or adhesives) or for cleaning up. The primary hazards are flammability and solvent vapours. Aqueous solvents (i.e. water-based) are not flammable and do not produce toxic vapors. Therefore, their use should always be preferred over those containing organic solvents.

Examples of arts materials containing solvents:

- thinner, petroleum based oils, oil paints, varnishes,
- adhesives, glues,
- degreasers.

Potential health effects of solvents:

- some can be poisonous (e.g. methanol) if swallowed.
- some can created skin irritation / allergy reactions.
- associated vapors can cause dizziness, headaches and in extreme cases asphyxiation.
- some solvents are capable of producing chronic effects (notably liver, kidney or nervous system damage) in people who are exposed to them over a period of years.

Paints and Pigments

There are pigments that present few, if any, hazards, and some that should be used with care. In particular, artists' paints and ceramic glazes contain a wide range of pigments and can include heavy metals to produce vivid colours. These metals, often toxic, can include:

- lead
- cadmium
- arsenic
- chromium
- mercury
- manganese

The use of pigments containing toxic metals should be avoided or minimized as much as possible. New pigments are available from certain suppliers that do not contain toxic metals. The following table gives a list of known toxic pigments.

Highly Toxic Pigments (known/probable carcinogens)	Moderately Toxic Pigments
• **Antimony white** – White 11 (antimony trioxide) • **Barium yellow** – Yellow 31 (barium chromate) • **Burnt umber or raw umber** (iron oxides, manganese silicates or dioxide) • **Cadmium red or orange** – Red 108 and Orange 20 (cadmium sulfide, cadmium selenide) • **Cadmium yellow** – Yellow 37 (cadmium sulfide) • **Cadmium barium colors** (cadmium colors and barium sulfate) • **Cadmium barium yellow** – Yellow 35 (cadmium sulfide/selenide, barium sulfate, zinc sulfide) • **Chrome green** – Green 15 (Prussian blue, lead chromate) • **Chrome orange** – Orange 21 (basic lead carbonate) • **Chrome yellow** – Yellow 34 (lead chromate) • **Cobalt violet** – Violet 14 (cobalt arsenate/phosphate) • **Cobalt yellow** – Yellow 40 (potassium cobalt nitrate) • **Emerald green** – Green 21 (arsenite) • **King's yellow** – Yellow 39 (arsenic) • **Lead or flake white** – White 1 (basic lead carbonate) • **Lead red** – Red 105 (Lead) • **Lithol red** – Red 49 (sodium, barium and calcium salts of soluble azo pigment) • **Manganese violet** – Violet 16 (manganese ammonium pyrophosphate) • **Mercadium orange** – Orange 23 (cadmium, mercury and sulfides) • **Molybdate orange** – Orange 45 (lead chromate, lead molybdate, lead sulfate) • **Naples yellow** – Yellow 41 (lead antimonate) • **Strontium yellow** – Yellow 32 (strontium chromate) • **Vermilion** – Red 106 (mercuric sulfide) • **Zinc sulfide** (Pigment white –barium carbonate) • **Zinc yellow** – Yellow 36 (zinc chromate)	• **Alizarin crimson** – (flakes of 1,2-dihydroxy-anthraquinone or insoluble anthraquinone pigments) • **Carbon black** (carbon) • **Cerulean blue** – Blue 36 (cobalt stannate) • **Cobalt blue** – Blue 28 (cobalt stannate) • **Cobalt green** – Green 19 (calcined cobalt, zinc and aluminum oxides) • **Chromium oxide green** – Green 17 (chromic oxide) • **Manganese blue** – Blue 33 (barium manganate, barium sulfate) • **Manganese violet** – Violet 16 (manganese and barium) • **Prussian blue** – Blue 27 (ferric ferrocyanide) • **Toluidine red** – Red 3 and 147 (insoluble azo pigment) • **Viridian** – Green 18 (hydrated chromium(III) oxide) • **Zinc white** – White 4 (zinc oxide)

Potential health effects of paints and pigments:

- ingestion or inhalation of heavy metals over time can lead to poisoning and other chronic effects.
- skin irritation from solvents found in paints.

Acids and Alkalis (Corrosives)

Several art activities use acids or alkalis. If diluted solutions have to be made up from concentrated acids or alkalis, always make sure **to add the acid or alkali to the cold water, and not vice versa**, to avoid possible splashes and generation of heat. Precautions are essential because concentrated acids or alkalis are highly corrosive to the skin and eyes.

Examples of arts materials containing corrosives:

- glass etching liquid (acid),
- pickling baths for metals,
- dyes,
- photography chemicals (stop bath, developers, accelerators),
- ferric chloride etching solutions,
- cement (contains lime).

Potential health effects of corrosives:

- ingestion can lead to the digestive tract irritation or poisoning.
- skin irritation (weak solution) or skin burns (strong solution).
- vapors can cause lung irritation, dizziness and asphyxiation (in extreme cases).

Wood, Stone and Other Sculpture Media

The primary hazards from woodworking and stonework are cuts and abrasions. You should receive instruction or training before beginning to use this type of equipment. However, the dust generated from the different work processes can cause lung irritation, asthma and can potentially also be toxic (e.g. silica dust, wood dust). Furthermore, sawdust can be a fire hazard if stored near flammables, and can be considered as a combustible dust that can trigger an explosion if dispersion and confinement situations are combined to the triangle of fire (Fuel/Oxygen/Ignition source). For this reason, the workshop must be cleaned daily.

Potential health effects of dusts:

- Miner's lung is caused through long-term exposure to fine dust; some stones (Sandstone, soapstone, granite …) contain silica and can produce symptoms similar to miner's lung under long-term exposure conditions.
- some naturally occurring rocks contain arsenic, asbestos or other heavy metals.
- clay dust is very fine and can also damage the respiratory tract.
- some wood dusts are known as sensitizers (exotic woods, Red Cedar …) or irritants.
- some wood dusts can cause dermatitis, asthma, chronic bronchitis.
- some wood dusts are reported to be highly toxic (cork oak, redwood, ebony, blackwood …) and carcinogens (see table below).
- moderate to high toxicity can be generated by the presence of preservatives, glues and adhesives in the wood.

Organisms	Common Name	Human Carcinogen
ACGIH (2008)	Western red cedar	No
	Oak and beech	***Confirmed***
	Birch, mahogany, teak, walnut	**Suspected**
	All other wood dusts	No
CIRC (1995)	***Wood dust***	***Confirmed***
DFG (2007)	Wood dust (except beech and oak wood dust)	Animal models only
	Beech wood dust	***Confirmed***
	Oak wood dust	***Confirmed***
NIOSH (1992)	**Wood dust**	**Potential (professional exposure)**
NTP (2005)	Wood dust	Reported
RSST (2001)	Wood dust (red cedar)	N/A
	Wood dust hard and soft, except red cedar	N/A

Ceramics

Clays are minerals composed of hydrated aluminum silicates, often containing large amounts of crystalline silica. Other impurities may include organic matter or sulphur compounds. Sometimes, grog (ground firebrick), sand, talc, vermiculite, perlite, “asbestos-like” fibers, and small amounts of minerals such as barium carbonate and metal oxides, are added to modify clay properties. Clays can be worked by hand or on the potter's wheel, or cast in a clay slurry into moulds.

Potential health effects of clays:

- inhalation of large amounts of clay dusts during mixing can create a condition known as “silicosis” or "potter's rot", arising from exposure to the free silica found in clays. Symptoms include: shortness of breath, dry cough, emphysema, and high susceptibility to lung infections such as tuberculosis.
- silica dust exposure is not hazardous by skin contact or ingestion.
- asbestos inhalation may cause asbestosis, lung cancer, mesothelioma, stomach cancer, and intestinal cancer.
- sand, perlite, grog, and vermiculite contain free silica and are, therefore, highly toxic by inhalation
- vermiculite is also frequently contaminated with asbestos.
- hypersensitivity pneumonia, asthma, or other respiratory problems may occur with exposure to months, or with inhalation of dry aged clay.
- wet clays are growth medium for molds and microorganisms that can worsen allergies or cause infections.
- firing process in fuel-fired or electrin kiln can release toxic and combustible chemicals, toxins, etc.

Glazes are mixtures of silica (*glass former*), aluminium (*stabilizer*), metal fluxes (*melters*) and colorants.

Potential health effects of glazes:

- chronic toxicity related to the silica.
- chronic toxicity related to the metal fluxes (lead, barium, lithium …).
- colorants can incorporate arsenic, cadmium, lead, antimony or chromium(VI) species that are considered as human carcinogens and highly toxic through inhalation or skin contact.

Photography

The greatest risk involved with photographic processing is the mixing of the stock solutions. The chemicals used can vary depending on the processing performed. Black and white techniques use a handful of chemicals while full colour processing can use several chemicals.

Examples of chemicals used on photo processing:

- developer (corrosives: *metol, amines*))
- developing baths (corrosives and toxic antifogging agents: *soda, sodium sulfate*)
- stop/fixing- bath (corrosives and toxic chemicals: *acetic acid, potassium chrome alun*)
- intensifiers and reducers (highly toxic, carcinogens, corrosives and oxidizers: *chrome salts*, *mercury, persulfates*)
- toning (highly toxic, sensitizers, carcinogens: *hydrogen sulfide,* hydrogen selenide, thiourea)
- colour dyes (toxic: *organic solvents*)
- hardeners and stabilizers (some contain *formaldehyde*)

Artificial Smoke or Mist

If artificial smoke is to be produced on stage, precautions must be taken to avoid anyone inhaling fumes. The area must always be well ventilated and the smoke has to be properly evacuated out of the room. The only substances that should be used to produce artificial smoke should be propylene glycol and glycerine.

Other substances can also be used, but only in smaller amounts and for short period of times such as:

- cryogens (dry ice, liquid nitrogen),
- butylene glycol, polyethylene glycol or triethylene glycol.

However, the following chemicals should not be used to produce artificial smoke or mist:

- ethylene glycol and diethylene glycol,
- mineral oil,
- petroleum spirits,
- charcoal,
- hexachloroethane or cyclohexylamine.

Fibres and Textiles

Health hazards in fibre or textile arts, include dusts, gases, fumes and vapours that are inherent to the used materials or are produced in the work process, and can be inhaled or affect the skin. Chemical hazards may include the use of dyes, paints, acids, alkalis or mothproofing agents.

Vegetable fibre materials may be contaminated with biological materials, such as moulds or mildew, that can cause allergic reactions. Exposure to vegetable dusts may cause lung irritation or other effects such as asthma, hay fever, bronchitis and emphysema. Animal products such as wool, hair, hides and feathers may also be contaminated with bacteria, moulds, lice or mites and must therefore be treated or fumigated before use.

Synthetic fibres (polyesters, nylon, acrylic, rayon and acetates) may release gas or other toxic residues which are left in the fabric after processing, as in the case of formaldehyde released by polyesters or permanent-press fabrics. Heating, scorching or otherwise altering synthetic materials chemically may release potentially hazardous gases or fumes.

The use of corrosive solutions and the treatment of fibers with boiling liquors create potential risks of burns and scalds. Hydrochloric acid and sulphuric acid are used in dying processes while sodium hydroxide (caustic soda) or hypochlorite solutions (bleach) are used for bleaching.

Potential health effects of fibre/textile work:

- exposure to organic solvent, organic dyes.
- carcinogenicity/mutagenicity and genotoxicity related to some dyes (aniline, benzidine …).
- toxic fumes or vapors.
- chemical burns (acids/bases).
- allergic reactions, sensitization.
- fiber dust (cotton, wool, dyestuff) can cause byssinosis and respiratory irritation.
- reproductive toxicity can be associated with the use of flame retardants, stain repellents, softners or antibacterial agents

Gas Welding

Gas welding typically uses an oxyacetylene gas flame (mixture of acetylene and oxygen gases) as a source of heat. Acetylene is an extremely flammable gas. It is different from other flammable gases because it is also unstable. A flashback can occur if there is a flammable mixture of fuel gas and oxygen in the hoses when the torch is lit. If it is not stopped, the flame will ignite the mixture and will travel backwards from the torch, along the hoses, through the regulator and into the cylinder. A flashback can trigger decomposition of the acetylene in the fuel hose, in the regulator and in the cylinder itself. Therefore, flashback arresters have to be installed onto the pressure regulators on both the acetylene cylinder and the oxygen cylinder with check valves for every 15 ft. of hose used.

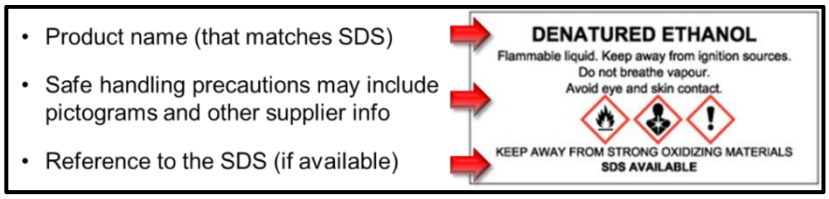
Some types of gas welding, such as soldering, use other fuel gasses such as propane or butane, which are highly flammable. The welding process generates a number of toxic air contaminants, including metal fume. If the metals being welded are coated with metals such as lead paint, zinc, chrome, cadmium, or other toxic materials, these metals will become vaporized and could be highly toxic if inhaled. Cobalt, chromium, cadmium, nickel, and beryllium are carcinogenic and cause brain damage. Lead and zinc are sometimes found in brazing rods, and fluoride and lead are common hazards associated with soldering.

Potential health effects of gas welding:

- toxic gas by-products (ozone, nitrogen oxides, carbon monoxide).
- toxic metal dust and fumes.
- heat, burns, flashes and noise.

Basic Preventative Measures

- **DO NOT** eat, drink, or smoke in the studios:
  - do not store food, drinks or cigarettes in studios or in close proximity to chemicals.
  - do not store arts materials in refrigerators that also contain food or drinks.
- **SUBSTITUTE** less hazardous materials or techniques whenever possible. There are many instances where highly toxic chemicals can be replaced by less toxic materials.
- **KNOW** the materials and their hazards. If labels do not have adequate information regarding contents, hazards, and precautions, read the MSDS of the product.
- **STORE** materials safely:
  - ALWAYS use unbreakable containers and label them clearly.
  - it is important to label containers into which a controlled or hazardous product is transferred, decanted or repackaged for use in Concordia's workplaces. The required information is minimal and should appear on all non-original containers. For example, a workplace label is required when pouring thinner into smaller, unlabelled containers. Please consult EHS website – Chemical Safety Program – Section WHMIS 2015 and the Globally Harmonized System – Label Requirement for information about workplace labels.



  - containers should always be tightly covered when not in use to prevent evaporation of the contents into the environment. NEVER store materials in containers which are normally used for food or drink (i.e. cups, pop bottles, Tupperware, jars, etc.).
- Store containers in appropriate cabinet:
  - flammable cabinet (yellow) for flammable and combustible liquids.
  - corrosive cabinet (blue) for acids or caustics (these chemicals must be segregated).
- **ENSURE** proper, effective ventilation (room ventilation or local exhaust, shown below) before performing any work.

Examples of local exhaust systems

- **ALWAYS WASH** your hands after working on your projects and before exiting the studio or workshop.
- Long / lose hair must be tied up.
- **DISPOSE** any hazardous waste in a responsible manner, following Concordia University procedures. More info can be obtained at hazardouswaste@concordia.ca.

- **NEVER** place hazardous chemicals in regular garbage.
- **WEAR** appropriate personal protective equipment (PPE) such as respirators, gloves, face shields, ear muffs, and footwear. The type of equipment used must match the hazard you are trying to protect yourself from (see next section).

Personal Protective Equipment (PPE)

Personal protective equipment (PPE) is not the best method of protection from the hazards associated with some of the arts, but in the absence of elaborate engineering control systems (e.g. ventilation), **it is the best alternative**.
PPE is designed to protect the wearer from specific hazards, either physical or chemical, and is intended for short term or limited use. Choosing the right type, along with the right size of PPE, ensures to fully protect the person against the type of hazard which is being controlled. Failure to ensure this will result in the person thinking that they are being protected when they are not.

Limitations

Certain types of PPE (e.g. gloves or respirators) have limitations caused by exposure to chemical substances. The type of PPE to be selected will vary depending on the type of substance or hazard to which the person is being exposed. **One type or brand of PPE does not protect against all hazards and often a combination of PPE is required.** Furthermore, single-use PPE, such as disposable gloves, are not meant to be re-used and should be discarded.

Chemical Resistant Gloves

Synthetic gloves of a suitable material are required to protect your skin from absorbing the chemical that it may be exposed to. The most common types of gloves are made of rubber (i.e. Neoprene, Nitrile, or Latex) or plastic (PVC, polyethylene, urethane). Leather gloves do not provide any protection from chemicals.
Not all types of synthetic gloves are resistant to all types of chemicals. The type selected must be matched against the chemicals that you are handling.
For example: Nitrile gloves have good resistance to 50% acetic acid, but natural rubber (latex) gloves have poor resistance. It is essential that the proper type of glove is chosen which will provide the greatest protection from the chemical being handled.
It is also important that gloves should be **CHANGED REGULARLY** (every two hours or less, ideally), with the old (contaminated) ones being discarded and replaced with new ones. The longer that synthetic gloves are exposed to the chemicals that they are repellent to, the greater the deterioration in the gloves.

Respiratory Protection

This type of protection is necessary where there is a potential hazard of inhaling toxic dusts or mists. Although there are several types of respiratory protection available, the two most common types are dust/mist respirators (masks) and chemical cartridge respirators. Again, the proper type of respirator must be chosen for the work being done and the substance being used or no protection will be provided.

Respiratory protection equipment is intended for individual use and not intended to be shared with other people.

Filtering Face-piece Respirators (FFRs)

Filtering Face-piece Respirators (FFRs) (commonly called dust respirators) are disposable masks composed of thick layers of filter materials which is worn over your nose and mouth and held in place by two elastic straps. These masks provide some degree of protection from certain dusts or particles and coarse spray mists of chemicals with low toxicity according to their rating:

- N : not resistant to oil particles
- R : somewhat resistant to oil particles
- P : strongly resistant to oil ("oil proof") particles
- 95, 99 or 100 : protection rating (%) in NIOSH test

Only types which carry a NIOSH approval number are acceptable (e.g. 3M Brand Model 8210). They provide a physical barrier against breathing the material, **but do not purify nor clean the air that you are breathing**. Their use is very limited and will not provide any protection against very toxic chemical vapors.

Air Purifying (Cartridge) Respirators

Air purifying respirators (APR) consist of a half- or full-face rubber mask, worn over the nose and mouth and held in place by adjustable straps which go over and behind your head. The mask is fitted with two removable filter cartridges consisting of either:

- *High Efficiency Particulate Air (HEPA) filter cartridges:* they consist of several layers of high density filter paper folded within a plastic container which is at least 99.97% efficient in collecting 0.3 micron diameter aerosol particles. It is useful for protection from hazardous particles or fine dusts (e.g. asbestos, silica).
- *Chemical vapor cartridges:* they contain a form of activated charcoal that filters out and traps the potentially harmful chemical vapours. The cartridges are chemical-specific (e.g. organic vapors, acid vapors…) and must therefore match the hazard you are trying to protect yourself from.

These units are heavier than the dust/mist masks, but provide far better protection for the wearer, provided that they are fitted properly.

Contact the Environmental Health & Safety office (ehs@concordia.ca) **to request a fit testing appointment, assistance in properly adjusting these devices and for guidance in respirator maintenance.**

This type of respiratory protection has some limitations:

- they cannot be used in areas of low oxygen concentration (i.e. an oxygen deficient atmosphere).
- they cannot be used with very toxic chemicals.
- they should not be used with chemicals which have no smell or odour.

Eye Protection

These devices are intended to protect the wearer's eyes from physical or chemical injury. Where any signs of damage or deterioration are noticed, these devices should be replaced without delay.

Impact Protection for Eyes / Face

Safety glasses (with side shields) and safety goggles (with open vents) are intended to protect the wearer from any physical injury from flying objects, particles or dusts which might enter the eye and cause damage. These devices do not seal off the eye area and are not suitable for use for protection from chemicals. Plastic face shields are intended to protect the face area and do not adequately protect the eyes when used by themselves. Safety glasses or goggles must be worn with face shields to ensure adequate protection.

Chemical Splash Goggles

Chemical splash goggles fit snugly against the wearer's face to prevent chemicals from entering the eyes and causing damage. These devices have protected air vents which will prevent liquid chemicals from coming in contact with the eyes in the event of a splash or splatter. Chemical splashes goggles are not intended to be used in atmospheres with high concentrations of toxic chemical vapours. For those environments, a supplied air respirator which provides full facial protection would be required.

Body Protection

Where potentially hazardous chemicals are being handled, mixed, or used, the person performing this function should make sure to minimize skin exposure by wearing pants, long-sleeves and closed shoes. A closed lab-coat or chemically resistant apron must also be worn for added protection. These are intended to prevent contact with clothing or skin by the chemical. These precautions should typically apply while handling hazardous materials with corrosive properties.

First-Aid Measures

If your skin comes in contact with chemicals (corrosives, toxic), flush the affected area with plenty of water for at least 15 minutes. If you get abrasive dust or splash any chemicals in your eyes, rinse your eyes with water for at least 15 minutes (preferably from an eyewash fountain). First-aid kits properly supplied, emergency eyewash and shower statons must be located and available in all areas where chemicals are being stored, handled and disposed.

Workshop users must always ensure a clear access to such emergency equipment.

If medical attention is required, please contact Security at extension 3717 or 514-848-3717.

Fire safety

Workshops and studios are provided with one or several fire extinguisher(s) suitable for the hazardous materials used and stored within the space. Fire extinguishers must be unobstructed and located in clear view. Workshop staff and students should know the location and proper use of the fire extinguishers in

their work areas.There are 4 types of fire extinguishers, each efficient to fight a specific type of fire; fire extinguishers of type ABC are commonly present in workshops.

Class A	Used for fires from combustible materials such as paper, wood, cardboard, and plastics.	
Class B	Used for flammable or combustible liquids such as solvents, gasoline, kerosene, grease and oil.	
Class C	Used for electrical equipment, such as appliances, computers, wiring, circuit breakers and outlets. You should never use water to extinguish a class C fire due to the risk of electrical shock.	
Class D	Used for combustible metals, such as magnesium, titanium, potassium and sodium.	

In the event of a fire, workshop users are not expected to extinguish the fire themselves. Users who have been trained to use a fire extinguisher may attempt to extinguish the fire safely. To do so:

- Use a fire pull station, alert security at extension 3717, or assign someone to do so before dealing with a fire.
- Make sure a clear escape route is available before attempting to deal with the fire.
- If a workshopuser is trained to use a fire extinguisher and feels that the fire can be controlled, they may use the PASS method to extinguish the fire:
  - **P**–Pull and turn the locking pin to break the seal.
  - **A**–Aim low by pointing the nozzle or hose at the base of the flames.
  - **S**–Squeeze the handle to release the extinguishing agent.
  - **S**–Sweep from side to side until the fire is out.
- Extinguishers work for approximately 15-30 seconds: if the fire has not been extinguished in that time, leave the area immediately.
- When leaving, close the door and **do not lock it**

Spills

Only small spills should be handled by users and only if they are comfortable or know how to clean it. A small spill consists of a release of a limited quantity of hazardous materials which does not pose a significant safety or health hazard to employees in the immediate vicinity or to the employee cleaning it up (e.g. 1L of paint).

A large (or emergency) spill consists of a release of a hazardous material that poses a significant safety or health hazard to persons in the immediate vicinity due to its properties (toxicity, volatility, flammability...) or by the release itself (quantity, space considerations, ventilation…).

Large spills should not be handled by users; they should readily:

- Advise and warn co-workers.
- If necessary, evacuate the area immediately.
- Do not touch the hazardous material
- Notify Security at extension 3717 or 514-848-3717
- Provide security with the following information:
  - Location of spill
  - Name of hazardous material
  - Quantity involved
  - Related health hazards and precautions to be taken
- Provide MSDS/SDS or appropriate documentation

Injury or Near-miss Reporting

In case of fire, spill or injury, immediately contact Security at extension 3717 or 514-848-3717 and complete a University Injury/Near-miss Report form available at www.concordia.ca/ehs under the "Report an injury or a near-miss" section. All completed forms must be submitted to the EHS office.

Contact Information

For more information concerning chemical safety in studios or workshop, please contact the Environmental Health & Safety Office (EHS) at:

Environmental Health & Safety (EHS)
514-848-2424 ext: 4877
ehs@concordia.ca
www.concordia.ca/ehs

References

- ✓ McCann, M. (1992). Artist Beware. New York: Lyons & Burford Publishers
- ✓ McCann, M. (1994). Health Hazards Manual for Artists. Lyons & Burford Publishers
- ✓ Encyclopedia of Occupational Health and Safety, 4th Edition, Jeanne Mager Stellman, Editor-in-Chief. International Labor Organization, Geneva, 1998.
- ✓ Occupational Safety and Health Administration: www.osha.gov
- ✓ Public Services Health & Safety Association: www.pshsa.ca
- ✓ Commission de la Santé et Sécurité du travail: www.csst.qc.ca
- ✓ Health Canada: www.hc-sc.gc.ca
- ✓ Canadian Centre for Occupational Health and Safety: www.ccohs.ca
- ✓ Canada's National WHMIS Portal: www.WHMIS.org

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