

# Designated Substance Control Program

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OCCUPATIONAL HEALTH & SAFETY

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## Definitions

**Ceiling (C):** The concentration that is not to be exceeded during any part of the working exposure

**Occupational illness:** A condition that results from exposure in a workplace to a physical, chemical, or biological agent to the extent that the normal physiological mechanisms are affected and the health of the worker is impaired.

**Short-term exposure limit (STEL):** the acceptable average exposure to a substance, over a short period of time, usually 15 mins. or less, as long as the time-weighted average is not exceeded.

**Time-weighted average (TWA):** a worker's daily exposure limit, averaged over an 8-hour day, of dust, chemicals, fumes, mists, gases, vapors, noise, taking into account the average levels of the substance or agent and the time spent in the area.

**Personal Protective Equipment (PPE):** safety equipment provided to protect workers from injury or illness when exposed to workplace hazards

## Purpose

The purpose of the Designated Substances Control program is an overarching program designed to provide general requirements pertaining to designated substances as per the OHSA, O.Reg. 490/09, and other applicable legislative requirements.

## Scope

This program applies to all departments, employees and contractor who regularly comes into contact with, or may come in to contact with a designated substance through the course of work or proximity to work being performed. It also applies to any person who acquires, handles, stores, removes, or disposes of a designated substance.

## Roles and Responsibilities

### The Employer

- Ensure that designated substances are identified and assessed in the workplace
- Develop and maintain an inventory of each designated substance and share with workers, the JOHSC and contractors
- Ensure that levels of the designated substance are monitored and the results provided to the JOHSC, and posted to the OHS board

- Put in place controls (engineering, administrative, work practices) and procedures to protect workers from exposure to designated substances in order to ensure that concentrations do not exceed the TWA, STEL, or the C, as set out by the Ministry of Labour, in conjunction with the JOHSC
- Provide/ supply all necessary PPE, as required
- Provide training to all affected workers on the designated substances that they may be exposed to
- Pay the expenses for medical examinations and clinical tests, as required
- Maintain records regarding worker exposures
- Where specified in the regulation, prepare and provide an emergency program to workers and the JOHSC, as necessary
- Provide a copy of the worker's personal exposure record to a physician for clinical testing or examination, as requested
- Notify a worker of an actual or suspected exposure, in writing

### **The Supervisor**

- Notify Occupational Health and Safety if the department uses, stores or disposes of designated substances
- Ensure that workers are made aware of all designated substances that they could be exposed to
- Facilitate access to designated substances inventories
- Ensure that workers receive training on any designated substances with which they may be exposed to
- Provide all necessary PPE to workers who may be exposed to a designated substance
- Develop and communicate safe operating procedures (SOPs) for all tasks related to designated substances
- Ensure that workers work in accordance with the SOP requirements
- Report to Occupational Health and Safety, any worker exposure to a designated substance and ensure that an Online Quick Report is completed
- Immediately investigate a worker exposure to a designated substance and implement control measures

### **The Worker**

- Worker in accordance with the Designated Substances Control Program (or specific designated substances control programs that apply), and all departmental SOPs and training
- Wear all required PPE, as required
- Report the discovery of any uncontrolled or previously unidentified designated substances to the Supervisor immediately
- Report any accidental exposures to a designated substances immediately to the Supervisor
- Consult with the designated substances inventories prior to commencing work where there is a potential for exposure
- Participate in medical surveillance, as required

## **Contractors**

- Follow all applicable Algonquin College Control Programs related to designated substances
- If a designated substance will be brought in to the College, approval must first be obtained before commencing work
- Review all applicable designated substances inventories before commencing work
- Prior to commencement of any new construction, or where there is the potential for a designated substance to be present, a DSR will be conducted. Subsequence hygiene monitoring may also be required.
- Ensure that all workers who may come into contact with a designated substance is properly trained and informed of Algonquin College's procedures
- Report immediately to Physical Resources, the discovery of any designated substance, accidental release or exposure
- Ensure that all regulatory requirements under O.Reg 490/09 (and any other Ontario Regulation that applies to designated substances) is applied and followed
- Ensure that the handling, storage, transportation (within the College campus), and disposal of any designated substance is done in accordance with O. Reg 490/09 and Algonquin College procedures

## **Occupational Health and Safety**

- Coordinating the development and review of the all Designated Substances control programs
- Provide training on designated substances to College staff
- Maintain copy of training records for designated substances training
- Provide guidance and consultation on any activities that involve a designated substance
- Coordinate the investigation of an the exposure or accidental release of any designated substance
- Provide advice and guidance regard control measures and procedures involving designated substances
- Report to the Ministry of Labour, if a worker is accidentally exposed to a designated substance or sustains an occupational illness as a result of an exposure to a designated substance
- Notify the JOHSC of any hygiene testing or air monitoring
- Share with the JOHSC, all reports pertaining to hygiene testing or air monitoring, and post the results on the health and safety board

## **Physical Resources**

- Updating and maintaining the designated substances inventories
- Conducting annual inspections of all identified ACM
- Coordinating the services of contractors for the removal, disposal and clean-up of designated substances

- Request a designated substances review (DSR) for any new construction or structural renovations, where a designated substance is suspected but may not be indicated in the inventory
- Coordinate post abatement air monitoring and provide copies of hygiene reports to Occupational Health and Safety
- Provide Physical Resources staff with any necessary PPE, as required, to working in areas that contain (or may contain) a designated substance
- Ensure Physical Resources staff are properly trained to identify designated substances and informed of the hazards associated with them
- Ensure that Physical Resources staff are required to consult any applicable designated substances inventory prior to commencing structural work, repairs or construction
- Notify contractors of all designated substances and provide them with a copy of the inventories for their review, prior to commencing work and ensure that they follow all of the Designated Substances Control Program requirements are met

## **Designated Substances**

Designated substances are those identified under the Designated Substances Regulation (O. Reg 490/90) and the Ontario Occupational Health and Safety Act.

There are 11 designated substances:

1. Acrylonitrile
2. Arsenic
3. Asbestos
4. Benzene
5. Coke oven emissions
6. Ethylene oxide
7. Isocyanates
8. Lead
9. Mercury
10. Silica
11. Vinyl chloride

## **Description of Designated Substances**

### **Acrylonitrile**

Acrylonitrile is a colorless to pale yellow liquid with an unpleasant odour. It is used in the manufacture of synthetic fibre, rubber, coatings, adhesives, etc. Acrylonitrile is toxic by inhalation and by skin exposure. Low-level exposure to acrylonitrile may cause eye and skin irritation, headaches, nausea or vomiting. High-level or prolonged exposure may result in damage to the heart, liver, kidneys or central nervous system.

## **Arsenic**

Arsenic is a strong poison. It is silver-grey, brittle, crystalline solid. Compounds containing arsenic are used as wood preservatives, insecticides and herbicides. Arsenic is also used in alloys of copper and lead. Elevated levels of arsenic can cause death, cancer or damage to nerves, the stomach, intestines and the skin. Lower concentrations can cause nausea, diarrhea, decreased production of red and white blood cells and abnormal heart rhythm.

## **Asbestos**

Asbestos is the name used for a group of fibrous minerals that occur naturally in soil and rock in some geographic areas. Asbestos fibres were formerly used in various building materials, including shingles, ceiling tiles, floor tiles, cement products, gaskets, insulation, and paper products. Asbestos affects mainly the lungs and respiratory system. Inhalation of asbestos may result in a build-up of scar-like tissue, resulting in cancer of the lungs and surrounding membrane.

Asbestos is present on campus. An Asbestos Management Control Program is in place. While asbestos is briefly addressed within the context of this current program, more thorough information is available by consulting the Asbestos Control Program. To identify areas of the College containing asbestos, please refer to the Asbestos Management Plan, available on the Physical Resources webpage on the College website.

## **Benzene**

Benzene is a colorless liquid with a sweet odour. It is widely used across North America to make other chemicals, which are then used to make plastic, resin, nylon, rubber, lubricants, detergents, drugs and pesticides. Benzene is also a natural component of crude oil and gasoline. Exposure to benzene, via inhalation, can cause dizziness, drowsiness and unconsciousness. Long-term exposure may result in anemia, leukemia or damage to bone marrow.

## **Coke Oven Emissions**

Coke oven emissions are the airborne constituents of the by-product created by destructive distillation of coal and petroleum. The emissions can occur from the production of steel, from petroleum products and from the lining of high temperature furnaces. Exposure to coke oven emissions is a possible cause of lung cancer. Although coke oven emissions have not caused a high number of cases of skin cancer, dermal contact with coke oven emissions should be avoided.

## **Ethylene Oxide**

Ethylene oxide is a colourless gas at room temperature that becomes a liquid at 12°C. It is used in the manufacture of ethylene glycol, surfactants, fumigants, fungicides and petroleum demulsifiers. Exposure routes include inhalation, ingestion and skin or eye contact. Exposure can cause irritation of the eyes, skin, nose and throat and headaches, nausea and drowsiness. Exposure to high concentrations can cause frostbite, reproductive toxic effects, convulsions, liver and kidney damage and cancer.

## **Isocyanates**

Isocyanates are a group of organic compounds formed by treating diamines with phosgene. They are used in the production of polyurethane foam, paints, varnishes, elastomers and resins. They are widely used in the automotive industry, auto body repair, and building insulation materials. Routes of exposure include inhalation, ingestion and skin or eye contact. Exposure can cause nausea, abdominal pain, bronchitis and irritation of the eyes, skin, nose and throat. High-level exposure can cause asthma, conjunctivitis, pulmonary edema and cancer.

## **Lead**

Lead is a naturally occurring bluish-grey metal. It is used in the production of batteries, ammunitions, solder, paint and pipes (including water pipes). The routes of exposure to lead are limited to inhalation and ingestion of lead, with the highest risk of lead exposure being the inhalation of lead containing dust. Lead can damage the nervous system, kidneys and the immune system.

The P building firing range has had confirmed airborne concentrations of lead, which is used exclusively by the Ottawa Police. Currently, the Police department no longer uses lead bullets, which had eliminated any ongoing lead issues, however, residual lead has been found in mechanical rooms associated with the firing range. Regular hygiene testing and clean up take place, as well as administrative controls and PPE for staff are regularly implemented to protect workers from exposure. Lead paint may be present in some locations of the College, although it is unconfirmed.

## **Mercury**

Mercury is a naturally occurring metal. At normal temperatures, it is a shiny, silver-white odourless liquid. When heated, mercury becomes a colourless, odourless gas. Mercury is used to produce caustic soda and was also used in thermometers, dental fillings and batteries. The central nervous system is very sensitive to all forms of mercury; however, vapour is especially harmful because it can directly reach the brain. Exposure to high levels of mercury can permanently damage the brain, kidneys and a developing fetus. Short-term exposure may cause lung damage, nausea, vomiting, skin rashes and eye irritation.

Mercury can be found in some lab equipment (such as thermometers, manometers, etc.), medical equipment (such as blood-pressure cuffs), thermostats, fluorescent

light fixtures, etc., which can be present on campus. Mercury-containing lab equipment (i.e., thermometers) should be substituted with less hazardous substances (where possible).

## Silica

Silica is a transparent to grey odourless powder or crystal. It occurs widely in nature as sand, quartz, flint and diatomite. It is used in the manufacture of glass, ceramics, abrasives, water treatment products, cosmetics, insecticides, paint and foods as well as in the drying of glassware and as a preservative for plant samples. Crystalline silica is used in the production of concrete, cement, acoustic ceiling tiles and ceramic tiles used in construction. The routes of exposure include inhalation and skin or eye contact. Exposure may cause pneumoconiosis and irritation to the lungs, skin or eyes. Chronic inhalation can lead to silicosis.

Silica is present in the sandpits (basement of B building) of the Ottawa Campus. It is also present in various trade program activities and construction activities where sand, mortar and concrete are used. The College has a Silica Control Program.

## Vinyl Chloride

Vinyl chloride, at normal atmospheric temperatures, is a colourless, flammable gas with a mild, sweet odour. It is used in the manufacture of polyvinyl chloride (PVC), which is used in furniture upholstery and many plastic products including plastic pipes, wire and cable coating. Exposure to vinyl chloride occurs mainly in workplaces where it is used to manufacture plastic. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness and, at extremely high levels, death. Prolonged exposure may cause liver damage, immune reactions, nerve damage and cancer.

### Table 1: Exposure Values

This table outlines the potential health effects associated with exposure to each designated substance and the established exposure limits (based on the information provided by the Ministry of Labour in O. Reg 833: Control of Exposure to Chemical and Biological Agents).

Designated Substance	Bodily System Affected	Exposure Values				
		Forms	Time Weighted Average (TWA)	Short-Term Exposure Limit (STEL)	Ceiling (C)	Notations
Acrylonitrile	Heart, liver, kidney,		2 ppm		10 ppm	Skin



	neurological					
Arsenic	Neurological, gastrointestinal, dermal		0.01 mg/m3	0.05 mg/m3		
Asbestos	Respiratory / lungs		0.1 f/cc			
Benzene	Hematological (blood), kidney, liver		0.5 ppm	2.5 ppm		Skin
Coke oven emissions	Respiratory / lungs		0.15 mg/m3			
Ethylene oxide	Reproductive, liver, kidney		1 ppm or 1.8 mg/m3	10 ppm or 18 mg/m3		
Isocyanates	Respiratory, exposed skin areas	Toluene Diisocyanate	0.005 ppm		0.02 ppm	
		Methylene bisphenyl isocyanate	0.005 ppm		0.02 ppm	
		Hexamethylene diisocyanate	0.005 ppm		0.02 ppm	
		Isophorone diisocyanate	0.005 ppm		0.02 ppm	
		Methylene bis	0.005 ppm		0.02 ppm	
		Methyl Isocyanate	0.02 ppm		0.06 ppm	Skin
		Ethyl Isocyanate	0.02 ppm		0.06 ppm	Skin
		Phenyl isocyanate	0.005 ppm		0.015 ppm	Skin
Lead	Gastrointestinal,	Elemental,	0.05			Skin

	neurological, musculoskeletal, hematological, kidney	inorganic and organic  Tetraethyl	mg/m3  0.10 mg/m3	0.30 mg/m3		(organic)  Skin
Mercury	Neurological, kidney, respiratory, dermal	Elemental, inorganic and organic  Alkyl compounds	0.025 mg/m3  0.01 mg/m3	0.03 mg/m3		Skin  Skin
Silica	Respiratory / lungs	Quartz/Tripoli  Cristobalite  Fume  Fused	0.10 mg/m3  0.05 mg/m3  2 mg/m3  0.1 mg/m3			
Vinyl chloride	Liver, immune reactions, neurological		1 ppm			

Table sourced from the University of Ottawa's Designated Substances Control Program:  
<https://orm.uottawa.ca/sites/orm.uottawa.ca/files/designated-substances-program.pdf>

## Designated Substances on Campus

Algonquin College has various designated substance present on campus. Some may be present within the infrastructure such as in the case of asbestos. Asbestos can be present in the insulative materials within a building, for example. Or, a designated substance may be present as a result of a chemical or substances used for teaching or research activities.

For all confirmed designated substances that are known to be present on campus, a program exists to monitor and control levels to ensure that workers are not exposed. Information regarding the type of designated substances and their locations can be sourced from Physical Resources.

Where a designated substance is used operationally, the school or department is required to notify Occupational Health and Safety prior to using the product so that

an assessment may be conducted to determine whether a control program is required.

Where a designated substance, previously unidentified is discovered, it must be reported to Occupational Health and Safety immediately so that control measures can be taken to prevent exposure.

## **Designated Substance Assessments**

When a designated substance is present in the workplace, the Occupational Health and Safety Act requires the employer to review the work methods and assess the likelihood of worker exposure. When there is a likelihood of worker exposure, a control program must be instituted that includes engineering controls, work practices, hygiene practices, training record keeping and medical surveillance (if applicable).

The designated substance regulations (Reg. 490/09) require that an assessment be conducted to determine the extent to which workers are exposed to the substance. If such assessments are to be thorough and accurate, it is important that they be organized in a step-by-step manner, as outlined in this document. In conducting the assessment, the procedures used in handling the substance, the actual and potential exposure of workers to the substance and the procedures necessary to control such exposure are taken into account. Any data that have already been gathered on air quality, worker exposure and existing control measures is also included. The core of the assessment consists of information obtained from an inspection of the workplace to evaluate first-hand, the nature of worker exposure to the substance. This inspection may be supplemented by air sampling where necessary.

## **When is Control Program Necessary?**

An appraisal of the situation is required to determine whether the Regulation applies. A control program is required when the following conditions exist:

- A designated substance is present
- Worker exposure is likely to occur
- Worker health would be impacted if exposed
- None of the exemptions listed in Regulation 490/09 apply.  
(Details regarding these exemptions can be found in the Regulation, sections 3-14)

If the conditions within the regulation apply, an assessment is required. OHS must be consulted when planning the assessment or evaluating the data. Other experts such as occupational hygienists, engineers, designers, and Workplace Health may

also be consulted. OHS will communicate all aspects of the Designated Substances Program with the Joint Occupational Health and Safety Committee.

The following information is must be gathered and reviewed as part of the assessment process, in order to determine the criteria for a control program:

- Engineering controls
- Work practices
- Hygiene practices
- Housekeeping procedures
- PPE
- Spills clean-up
- Disposal
- Medical surveillance

**Table 2: Designated Substance Control Program Assessment Tree**

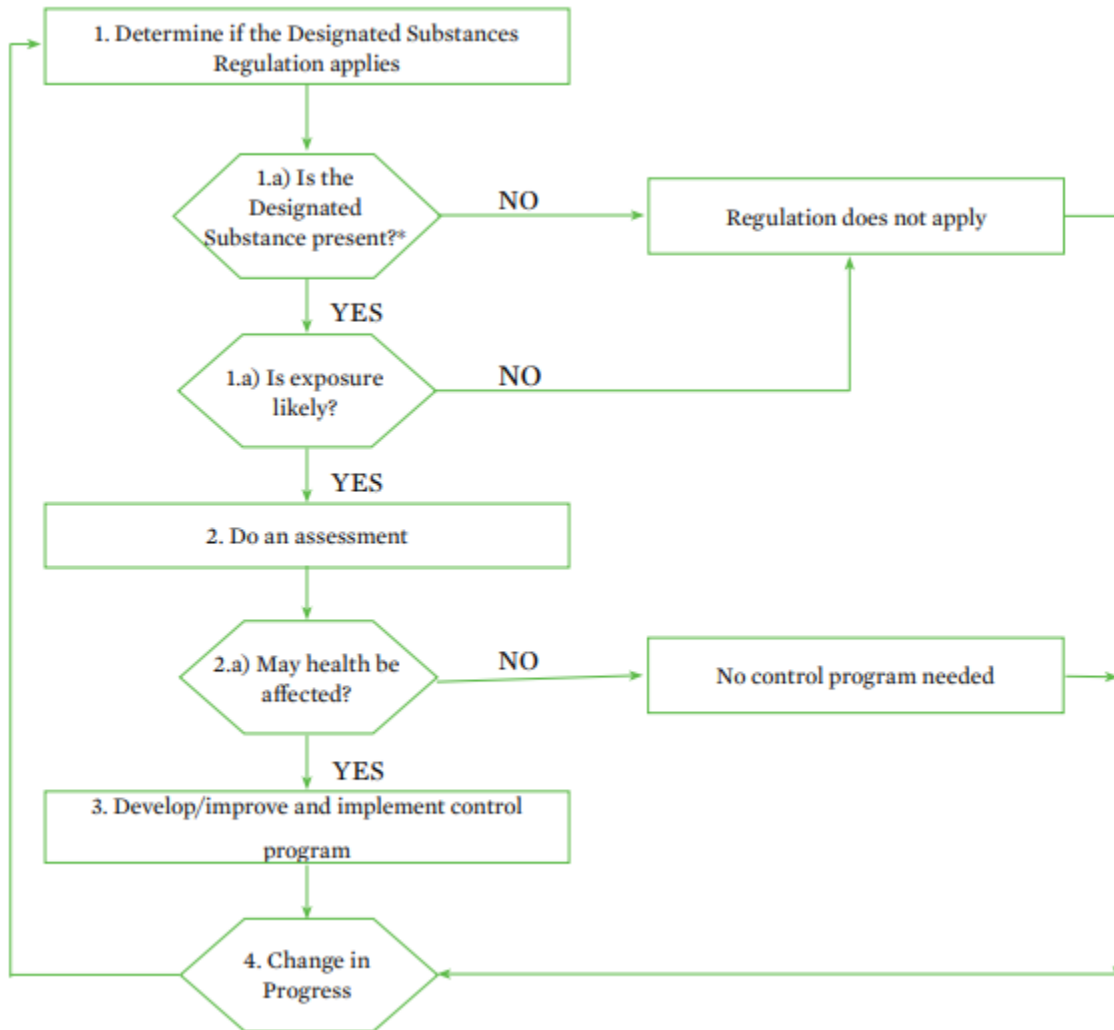


Table sourced from Health and Safety Ontario's Workbook for Designated Substance Assessments:  
[http://www.wspss.ca/WSPS/media/Site/Resources/Downloads/WrkbkDesigSubst\\_Final.pdf?ext=.pdf](http://www.wspss.ca/WSPS/media/Site/Resources/Downloads/WrkbkDesigSubst_Final.pdf?ext=.pdf)

**Resources:**

University of Ottawa's Designated Substances Control Program:

<https://orm.uottawa.ca/sites/orm.uottawa.ca/files/designated-substances-program.pdf>

Western University's Designated Control Program:

[https://www.uwo.ca/hr/form\\_doc/health\\_safety/doc/procedures/ds\\_program.pdf](https://www.uwo.ca/hr/form_doc/health_safety/doc/procedures/ds_program.pdf)

Health and Safety Ontario's "Workbook for Designated Substance Assessment":

[http://www.wspss.ca/WSPS/media/Site/Resources/Downloads/WrkbkDesigSubst\\_Final.pdf?ext=.pdf](http://www.wspss.ca/WSPS/media/Site/Resources/Downloads/WrkbkDesigSubst_Final.pdf?ext=.pdf)