



**Appendix A Designated Substance Assessment Form**

**RECORD OF DESIGNATED SUBSTANCE ASSESSMENT**

**SUBSTANCE:** Vinyl Chloride

**DATE:** June 5, 2007

**COMPANY:** McMaster University

**DEPARTMENT OPERATIONS:**  
Civil Engineering

**LOCATIONS:**  
JHE 222

**ASSESSMENT PREPARED BY:**  
Sarah Dickson

**TITLE:**  
Assistant Professor

**DATE PREPARED:** June 5, 2007

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**APPLICATION – WORKSHEET 1: IS THE DESIGNATED SUBSTANCE PRESENT?**

1. Do any material safety data sheets from your suppliers indicate the presence of the substance?

YES

NO

2. If substance is present, indicate the department where it is used, nature of the use (i.e. Direct or Indirect), and the quantity used per month or year:

<b>Product Name</b>	<b>Department</b>	<b>How Used? Direct / Indirect</b>	<b>Quantity Per Month / year</b>
Vinyl Chloride Stock Solution (2000 µg/mL)	Civil Engineering	Direct	<15mL/year

**CONCLUSIONS**

Read statements and check applicable box:

Substance not present anywhere in the workplace; regulation does not apply

**No Assessment needed**

Processes / activities have been identified where substance present.

**Proceed to worksheet 2**

**APPLICATION – WORKSHEET 2: IS WORKER EXPOSURE LIKELY?**

1. In what form does the substance enter the plant?

Product Title: Vinyl Chloride / Vinyl Chloride Monomer / Chloroethene / Chloroethylene / VCM /  $C_2H_3Cl$  Stock Solution (2000  $\mu\text{g/mL}$ )

Type of Container: glass

Size of Container: 1.2mL (pack of 12)

2. Is this form altered during use or in the operation: YES  NO

If YES, indicate the altered form:

3. Is there a possibility of the substance being released into the workplace environment during normal use? YES  NO

(not during *normal* use, however, an accident could possibly occur if the container is dropped while being transported from the flammable storage cabinet to the fume hood or vice versa, [a distance of approximately 10 feet] the container could break, resulting in exposure.)

If YES, indicate the stage of the operation or areas where this can occur.

4. If YES to Question 3, specify the job functions and approximate number of employees who might be exposed:

**Job Function**

**Number of Employees**

5. If YES to Question 3, indicate how workers could be exposed:

Inhalation  Ingestion  Skin Absorption  Skin Contact

6. If NO to Question 3, is there a likelihood of escape due to leaks, accidents, etc.?

YES  NO

7. Are workers likely to be exposed? YES  NO

**CONCLUSIONS**

**Are there any activities / situations where exposure by any route is likely?** YES  NO

If NO, no further action is necessary.

Date completed: \_\_\_\_\_

If YES, an assessment is necessary – **proceed to Section III.**

**Note:** If protection against exposure has been left up to some engineering control measure which can fail or deteriorate for any reason, or to a work hygiene practice, an assessment is necessary – **Proceed to Section III.**

**ASSESSMENT – WORKSHEET 3: PROCESS DESCRIPTION**

NAME OF PROCESS: Dilution of vinyl chloride into standard solutions for use with GC apparatus.

	<b>Process Flow</b>	<b>Description</b>	<b>Likely Exposure Yes / No</b>
1.	<div style="border: 1px solid black; padding: 5px; text-align: center;">Transfer of vinyl chloride stock solution from flammable storage cabinet to fume hood.</div>	1. The container of vinyl chloride stock solution is removed from flammable storage and placed in the fume hood.	1. No. (only if accidental spill occurs, which is not likely) A carrier device will be used to transport the stock.
2.	<div style="border: 1px solid black; padding: 5px; text-align: center;">Dilute vinyl chloride stock (2000µg/mL) to standard concentrations (1ppb to 1000ppm).</div>	2. The vinyl chloride stock is diluted via a gas-tight syringe through the vial septum in order to obtain the proper standard concentrations.	2. No.
3.	<div style="border: 1px solid black; padding: 5px; text-align: center;">Transport vinyl chloride standards to gas chromatograph.</div>	3. Prepared standards are transported to the gas chromatograph, in gas-tight vials, in a vial tray.	3. No. (only if accidental spill occurs)
4.	<div style="border: 1px solid black; padding: 5px; text-align: center;">Replace vinyl chloride stock solution to flammable storage cabinet.</div>	4. The vinyl chloride stock solution is replaced in the flammable storage cabinet for future use.	4. No. (only if accidental spill occurs) A carrier device will be used to transport the stock.

**ASSESSMENT – WORKSHEET 4: EXISTING CONTROLS**

Process Flow Stage	Control Description	Problems / Recommendations
<p>1. Transfer of vinyl chloride from flammable storage cabinet to fume hood.</p> <p>2. Dilute vinyl chloride stock (2000µg/mL) to standard concentrations.</p> <p>3. Transport vinyl chloride standards to gas chromatographer.</p> <p>4. Replace vinyl chloride stock solution to flammable storage cabinet.</p>	<p><b>Engineering Controls:</b> Vinyl chloride is stored in a sealed container preventing release. All work being done with vinyl chloride is completed within a fume hood, thus maintaining permissible exposure limits. No source of extreme heat or flame will be permitted within the working vicinity of vinyl chloride.</p> <p><b>Work Practices:</b> Vinyl chloride solutions (stock and diluted) will always be transferred from sealed vials through septa using gas-tight syringes, and all laboratory safety precautions taken in the transfer and use of vinyl chloride. Splash proof goggles and Nitrile gloves are required when using vinyl chloride solutions.</p> <p><b>Hygiene Facilities and Practices:</b> Eyewash stations, sinks, emergency showers etc. are located throughout the laboratory. Laboratory users will wash thoroughly upon entrance to and exit from the lab space, and any contaminated clothing will be washed before re-use. Eating, drinking and smoking are all prohibited in the laboratory environment.</p>	<p>Check to make sure fume hood is fully functioning prior to commencing work. Both the alarm and the draw will be checked.</p> <p>Needle pricks are a possibility which will be mitigated through the use of two layers of Nitrile gloves.</p>

**ASSESSMENT – WORKSHEET 5: EXISTING CONTROLS (cont.)**

Process Flow Stage	Control Description	Problems / Recommendations
	<p><b>Training / Information:</b> Employees will be instructed by their supervisors as to the dangers and hazards associated with the use of vinyl chloride. This shall include health hazards, physical properties associated with vinyl chloride (e.g. Flammability), emergency procedures, correct equipment use (e.g. personal protective equipment), personal hygiene responsibilities, exposure limits etc.</p> <p><b>Emergency Procedures / Equipment:</b> Immediate evacuation of the area is a top priority as well as contact with an emergency spill team (Dial *88). Removal of any sources of ignition should also be undertaken, to avoid potential fire. Only properly respirated/protected individuals should enter the spill area. The spill should be detected and allowed to evaporate while being properly ventilated. The spill area should be washed with water after evaporation. Appropriate warning signs will be placed on all doors leading to the contaminated area.</p> <p><b>Personal Protective Equipment:</b> Individuals working with vinyl chloride <i>who may be exposed to levels of contamination above safe limits</i> must be properly respirated. This means, a regulatory compliant air-purifying respirator with the appropriate chemical cartridges and/or particulate filters or a positive-pressure supplied-air respirator based on substance-specific regulatory requirements. <b>Note:</b> This would only happen in a spill situation, as proper work practices dictate that the vinyl chloride be used in the fume hood <i>only</i>. Splash proof goggles and Nitrile gloves (double layer) are required when using vinyl chloride solutions.</p>	

**ASSESSMENT – WORKSHEET 6: JOB EXPOSURE ANALYSIS**

<b>Process Flow Stage</b>	<b>Job Title</b>	<b>Total Number of Employees</b>	<b>Tasks where Exposure Likely</b>	<b>Duration Hrs per Week</b>	<b>PPE Req'd to be Used</b>
1. Transfer of vinyl chloride (using carrier) from flammable storage cabinet to fume hood.	Graduate Student	1	None	2 minutes	Splash proof goggles, Nitrile gloves (double layer)
2. Dilute vinyl chloride stock (2000µg/mL) to standard concentrations.	Graduate Student	1	None	1 hour	Splash proof goggles, Nitrile gloves (double layer)
3. Transport vinyl chloride standards to gas chromatograph	Graduate Student	1	None	2 minutes	Splash proof goggles, Nitrile gloves (double layer)
4. Replace vinyl chloride stock solution (using carrier) to flammable storage cabinet.	Graduate Student	1	None	2 minutes	Splash proof goggles, Nitrile gloves (double layer)
<b>CONCLUSIONS</b>					
Jobs / tasks to be noted during walk-through survey:					
Transfer of vinyl chloride to and from flammable storage cabinet and preparation of vinyl chloride Standards.					

**APPLICATION – WORKSHEET 6: HEALTH EFFECTS**

1. Any reported health effects? If so, describe.

No reported health effects in our own laboratory; however the following information was obtained through literature:

*Possible Health Effects associated with high levels of exposure to vinyl chloride are as follows:*

At high vapour concentrations vinyl chloride depresses the function of the central nervous system, causing dizziness, light headedness and unconsciousness. As vinyl chloride can be a liquid when under pressure at room temperature, dermal (skin) exposure to liquid vinyl chloride is possible; skin burns may result by rapid evaporation of liquid vinyl chloride and consequent freezing of the skin. On repeated exposure to vinyl chloride vapour, usually over many years, some workers have developed a type of cancer of the liver called angiosarcoma (ASL). The development of ASL reflects previous high exposure levels to vinyl chloride. There is generally a period of 20 years or more between the time of first exposure and the development of the tumour, which is called the latent period. ASL is rare among the general population. Other health effects related to exposure to vinyl chloride may include:

- bone resorption, particularly of the finger tips (acro-osteolysis);
- Raynaud's syndrome, a condition which affects the circulation of the hands and feet;
- scleroderma, a degenerative condition which causes stiffness of the skin and soft tissues; and
- hardening (fibrosis) of the liver.

2. Any current Medical Program? If so, describe.

No.

3. Previous exposure monitoring results? If so, describe.

None.

**CONCLUSIONS**

Health effects known at this stage:

YES

NO

Further information required:

YES

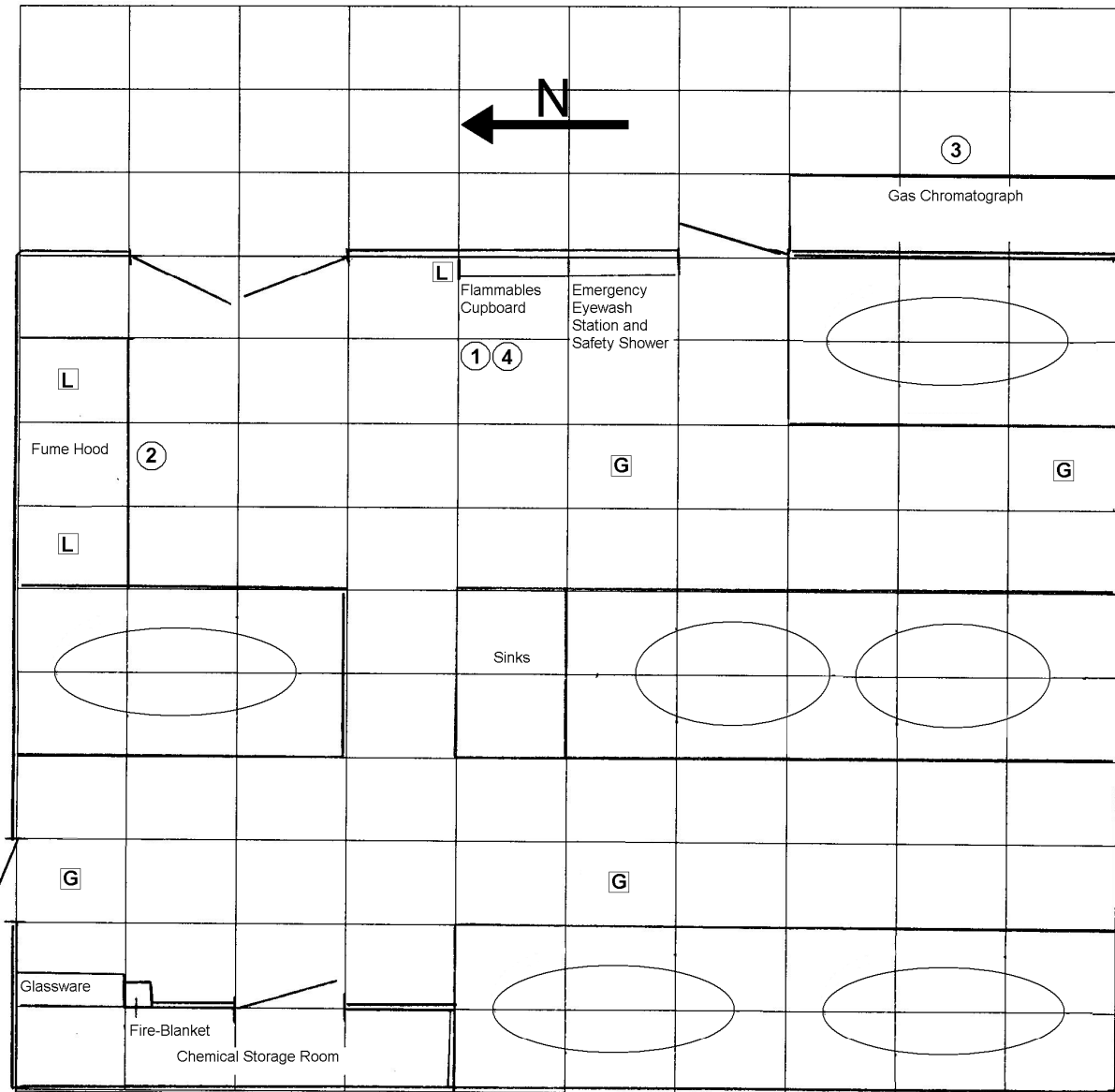
NO



**APPLICATION – WORKSHEET 7: FLOOR PLAN**

LOCATION: JHE 222

DATE: June 5, 2007



DIMENSIONS: L 40 ft W 30 ft H 14 ft

- WORK STATION – enter number from job title – Worksheet 5
- ▲ EXPOSURE SOURCE – enter number from Process Flow – Worksheet 3
- VENTILATION – enter L for local exhaust, and G for general ventilation

**APPLICATION – WORKSHEET 8: WALK THROUGH**

**Evidence of Contamination:**

No.

**Hygiene Facilities and Work Practices:**

Fully functioning eyewash stations, sinks, emergency showers, and proper hygienic practices followed.

**Ventilation Systems:**

Fume Hoods used for all aspects of standard preparations.

**Storage Facilities:**

Vinyl chloride stored in flammable storage cabinet with separate venting.

**APPLICATION – WORKSHEET 8: WALK THROUGH (cont.)****Dispensing Procedures:**

Vinyl chloride only dispensed within the fume hood, and only with gas-tight syringes through septa.

**Housekeeping:**

The lab is kept free of clutter and debris in order to promote a safe working environment. All chemicals are immediately returned to their proper storage locations after use. Wastes are disposed of according to the McMaster University waste disposal guidelines.

**Personal Protective Equipment:**

Splash proof goggles, and Nitrile gloves are available for use in the laboratory (note: a double layer of Nitrile gloves is required to reduce the risk of needle pricks).

**Emergency Facilities / Procedures:**

All emergency equipment is available, and emergency plans are in place in case of accidental spill. Immediate evacuation of the area is a top priority as well as contact with an emergency spill team (Dial \*88). Removal of any sources of ignition should also be undertaken, to avoid potential fire. Only individuals equipped with proper respirators, goggles and gloves should enter the spill area. The spill should be detected and allowed to evaporate while being properly ventilated. The spill area should be washed with water following evaporation. Appropriate warning signs will be placed on all doors leading to the contaminated area. Supervisors must be notified as necessary and the appropriate accident/incident forms be filled out.

**APPLICATION – WORKSHEET 9: WALK THROUGH CONCLUSIONS**

1(a). Were any areas found where controls are required or where existing controls may require improvement?

YES  NO

1(b). If YES, indicate the areas where the controls may be required or where existing controls may require improvement.

**AREA**

**SUGGESTED IMPROVEMENTS**

2(a). Personal exposure monitoring is required. YES  NO

2(b). If YES, indicate where:

3. Indicate any workers for whom medical testing and / or examinations may be required.

None.

**APPLICATION – WORKSHEET 10: HEALTH EFFECTS**

CONCLUSION A: NO WORKER'S HEALTH MAY BE AFFECTED

CONCLUSION B: A WORKER'S HEALTH MAY BE AFFECTED.

Only if accidental spillage occurs; however this is very unlikely as in the event of a spill, all workers will immediately evacuate the premises, limiting their exposure time and as a result, any possible adverse health effects.

**OVERALL CONCLUSION**

A control program is necessary. YES  NO

Improvements needed in existing program:

DATE June 5, 2007

SIGNED