



**TOTAL VOLATILE ORGANIC COMPOUND SAMPLING
SIR WILFRED GRENFELL COLLEGE
CORNER BROOK, NL**

Prepared for:

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EXECUTIVE SUMMARY

Pinchin LeBlanc Environmental Limited (Pinchin) was retained by Mr. Steve Hynes of Sir Wilfred Grenfell College (SWGC) to conduct Total Volatile Organic Compounds (TVOC) sampling. The assessment was conducted throughout the Arts & Science building of SWGC in Corner Brook, NL. Ms. Karla Coles performed the assessment from October 12 - 14, 2013.

The assessment was conducted as a result of air quality concerns during the application of the floor sealant in the gymnasium. It was reported that one coat of sealant was put on the gymnasium floor and there was concerns with the smell migrating to other areas of the building. It was decided that the sampling would begin in the area of the gymnasium and expand, if necessary, until measurements were within applicable guidelines.

At the time of the sampling it was noted that the gymnasium has been sealed shut with the ventilation system turned off. It was recommended to SWGC that the gymnasium needed air changes and the air inside the gymnasium had to be exhausted to the outside.

The TVOC readings collected throughout the Arts & Science Building on October 12, 2013 were well above the Health Canada suggested comfort level of 0.4 ppm where complaints may be expected. This solidified the notion that an increase in ventilation was needed. It was recommended to increase fresh air levels into the Gymnasium and exhaust VOC laden air to the outside.

The TVOC readings collected throughout the Arts & Science Building on October 13, 2013 were still above the Health Canada suggested comfort level of 0.4 ppm where complaints may be expected but improved drastically from the previous day. The gymnasium continued under negative pressure and windows, where possible, were left open. It was recommended to continue exhausting air from the gynasium.

The TVOC readings collected throughout the Arts & Science Building on October 14, 2013 were at levels that would be considered normal. They were either slightly above or at the Health Canada suggested comfort level of 0.4 ppm but the outdoor level was at 0.3 ppm. It was further recommended to continue exhausting air from the gymnasium building until the students return to classes the next day.

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1.0 INTRODUCTION AND SCOPE

1.1 Statement of Understanding

Pinchin LeBlanc Environmental Limited (Pinchin) was retained by Mr. Steve Hynes of Sir Wilfred Grenfell College (SWGC) to conduct Total Volatile Organic Compounds (TVOC) sampling. The assessment was conducted throughout the Arts & Science building of SWGC in Corner Brook, NL. Ms. Karla Coles performed the assessment from October 12 - 14, 2013.

The assessment was conducted due to air quality concerns during the application of the floor sealant in the gymnasium.

1.2 Scope of Work

This assessment was conducted throughout the Arts & Science building of SWGC and involved the following activities:

- Development of a sampling strategy;
- Measurement of the following indoor air quality (IAQ) factors:
 - Concentration of total volatile organic compounds (TVOC); and,
- Preparation of this report.

1.3 Assessment Methodology

The investigator interviewed the SWGC representative to discuss the sampling strategy. It was reported that one coat of sealant was put on the gymnasium floor and there was concerns with the smell migrating to other areas of the building. It was decided that the sampling would begin in the area of the gymnasium expand, if necessary, until measurements were within applicable guidelines. There were two more coats of the sealant to be applied and the sampling was to be conducted during that work.

1.4 Test Methods

Spot-check sampling for total volatile organic compounds (TVOCs) was conducted with a miniRAE. The instrument is a portable gas detector that uses Photo-ionization technology to detect a large range of Volatile Organic Compounds (VOCs). Outdoor ambient air measurements were made in addition to samples collected in the building.

All sampling was performed in compliance with current professional practice¹.

¹ American Industrial Hygiene Association: Field Guide for the Determination of Biological Contaminants in Environmental Samples. H.K. Dillon, P.A. Heinsohn, and J.D. Miller, Eds. AIHA, Fairfax, VA (1996).

2.0 ASSESSMENT AND FINDINGS

2.1 Facility Description

The Arts & Science building is a three storey structure with basement. The gymnasium is located in the southwest corner of the building.

2.1.1 Results of Interview

The following information was reported to the consultant by the SWGC representative:

- The HVAC unit had been turned off during the floor sealant application and all doors to the gymnasium were sealed.

2.2 Results of Indoor Air Quality Monitoring

2.2.1 Background

The term “volatile organic compounds” (VOCs) refers to organic compounds with a boiling point of greater than 50°C and less than 260°C. Offices or other non-industrial workplaces can contain many VOC sources such as paints, furniture, cleaners, personal care products and office equipment. Where VOCs are present at higher concentrations, there is a risk of adverse health effects such as unacceptable odours, eye, nose or throat irritation, or headache. Indoor air in office environments is usually a mixture of many VOCs present in varying concentrations, measured in micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) or parts per million in air (ppm). The sum of the VOCs in an environment is termed the Total Volatile Organic Compound concentration (TVOC), frequently measured by direct reading instrumentation or laboratory methods. IAQ investigators use the TVOC concentration to estimate the risk of adverse health effects.

There is no legislated TVOC standard or even a consensus standard set to prevent all IAQ complaints from VOCs in office buildings. In the past, Health Canada published guidance based on work by the Danish researcher Lars Molhave, recommending a threshold of 200 $\mu\text{g}/\text{m}^3$ for no adverse health effects, and noting that discomfort could be expected above 3,000 $\mu\text{g}/\text{m}^3$. However, Molhave has recently withdrawn support for these thresholds and Pinchin no longer recommends use of the Health Canada TVOC guidelines.

The literature does include some guidance on typical and maximum acceptable concentrations. The US Environmental Protection Agency (US EPA) has conducted one of the largest IAQ investigations of IAQ in office buildings, including VOC concentrations. In the period of 1994-1998, the US EPA Building Assessment Survey and Evaluation (BASE) study surveyed 100 randomly selected office buildings across 37 cities and 25 states. These were not known to be “problem” buildings. The study found 25 VOC compounds to be present in every building tested. This study found TVOC levels in the 100 randomly selected office buildings to be about

400 µg/m³, while some buildings ranged as high as 1,200 µg/m³. Under the Canada Green Building Council Leadership in Energy and Environmental Design (LEED) program, newly built buildings receive IAQ credits for having TVOC concentrations under 500 µg/m³ (0.2 ppm). Pinchin would consider an office environment with TVOC concentrations up to 1,000 µg/m³ (0.4 ppm) to be at little risk of IAQ complaints. Complaints might be expected if concentrations were much above that level.

2.2.2 Summary of Data

The spot check measurements throughout the Arts & Science building are provided in table 2.2.2 presented below. It should be noted that all sampling results were instantaneous and recommendations provided to SWGC in real time while data was being collected.

**Spot Check Monitoring of TVOCs
 Arts & Science Building, SWGC, Corner Brook, NL
 October 12-14, 2013**

Location	TVOC (ppm)
<i>October 12, 2013 (PM)</i>	
Outdoors	0.4
Gymnasium Entrance	157.0
Gymnasium Door #1	195.7
Gymnasium Door #2	176.8
Gymnasium Mid Hallway	189.0
Woman's Change Room	147.7
Gymnasium End Hallway	162.3
Pool Office	150.5
Pool Deck	73.0
Pool Viewing Area	111.0
Stairwell	143.0
Help Desk	45.0
Stage Craft	12.0
Computer Lab	11.4
Mid Stairwell	27.6
Room 282	14.2
Room 285	24.6
Office/Small Hallway	24.3
Crossroads	26.6
Bursar's Office	21.7
Campus Police Office	14.5
Main Entrance	5.4
Room 273	2.5
Woman's Washroom	20.9

Location	TVOC (ppm)
Chemistry Lab Hallway	21.3
Room 244	22.4
Room 236	21.6
Entrance #24	20.2
Student Services	3.3
Stairwell Adjacent Student Services	15.2
Room 332B	8.8
Room 332N	6.9
Room 305	6.2
Door #25	11.8
Bookstore	16.6
Cafeteria	1.6
Basement	6.9
<i>October 13, 2013 (AM)</i>	
Outdoors	0.3
Gymnasium Entrance	5.4
Gymnasium Mid Hallway	5.9
Gymnasium End Hallway	4.6
Cage	3.7
Equipment Room	3.3
Woman's Change Room	3.4
Men's Change Room	3.6
Pool Office	4.2
Pool Deck	2.5
Gymnasium Stairwell	4.7
Pool Viewing Area	6.1
Stage Craft	3.9
Computer Lab	1.9
Mid Stairwell	1.4
Room 364	1.6
Crossroads	0.7
Hallway Adjacent to Room 206	0.7
Room 310	0.6
Room 345	1.4
Basement	0.7
<i>October 13, 2013 (PM)</i>	
Outdoors	0.3
Gymnasium Entrance	1.9
Gymnasium Mid Hallway	1.9
Gymnasium End Hallway	2.2
Gymnasium	1.3

Location	TVOC (ppm)
Cage	1.2
Woman's Change Room	2.8
Men's Change Room	2.1
Pool Office	2.0
Pool Deck	1.7
Gymnasium Stairwell	1.5
Pool Viewing Area	1.4
Stage Craft	1.1
Computer Lab	1.1
Mid Stairwell	0.9
Room 364	0.8
Crossroads	0.9
Hallway Adjacent to Room 206	2.1
Basement	0.7
<i>October 14, 2013 (PM)</i>	
Outdoors	0.3
Gymnasium Entrance	0.5
Gymnasium Stairwell	0.4
Gymnasium Hallway	0.4
Cage	0.5
Woman's Change Room	0.8
Pool Office	0.6
Pool Deck	0.8
Pool Viewing Area	0.4
Stage Craft	0.4
Computer Lab	0.4
Mid Stairwell	0.4
Room 364	0.4
Crossroads	0.4
Hallway Adjacent to Room 206	0.4
Third Floor	0.4
Student Services	0.4
Basement	0.4
1. Total volatile organic compounds (TVOC) levels above 1.0 mg/m ³ (approximately 0.4 ppm), one may expect complaints. * Numbers in RED are above the recommended value.	

2.2.3.3 Conclusions

The TVOC readings collected throughout the Arts & Science Building on October 12, 2013 were well above the Health Canada suggested comfort level of 0.4 ppm where complaints may be

expected. This solidified the notion that an increase in ventilation was needed. It was recommended to increase fresh air levels into the Gymnasium and exhaust VOC laden air to the outside.

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3.0 LIMITATIONS

Work performed by Pinchin was conducted in accordance with generally accepted engineering or scientific practices current in this geographical area at the time the work was performed. No warranty is either expressed or implied, or intended by the agreement executed with the Client, or by furnishing oral or written reports or findings. The Client acknowledges that subsurface and concealed conditions may vary from those encountered or inspected. Pinchin could only comment on the conditions observed on the date(s) the assessment was performed.

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Air sampling results (if any) will apply only to the time and conditions of the testing and may not be used to reliably predict conditions on other days.

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