PA

PE 1-17-1

File No. 895-7-5

Thermal Comfort and Air Quality Survey

CBC Administration Building

250 Lanark Avenue, Ottawa

January/February 1980

Labour Canada

Occupational Safety and Health Branch

April, 1980

Summary

A thermal comfort and air quality survey was conducted at the CBC Administration Building, 250 Lanark Ave., Ottawa, during January and February 1980. The survey was requested by the CBC following complaints by employees of minor ailments attributed to stale, dusty air. The temperature and humidity of the office air, and the levels of airborne contaminants in it, were all found to be within permissible levels.

Table of Contents

1. Introduction

This survey resulted from a request by Mr. R.C. Wilson, Safety Officer, CBC, to Mr. W.J.C. Burr, Manager, Ottawa District Office, Labour Canada, dated November 15, 1979. The request was made because a number of employees in the Administration Building had reported to the nurse headaches, eye irritation, nasal and sinus irritation, etc., which they attributed to the stale and dusty air in their offices.

On December 13, 1979 CBC and Labour Canada personnel met at the CBC Administration Building, 250 Lanark Avenue, Ottawa, to discuss the request. The participants of this meeting are identified in Appendix A. The meeting also included interviews with affected employees and an inspection of the building.

The complaints started in November 1979 by employees on the third floor. One of them consulted her doctor who advised her that stale and dusty air at work could be the cause of her symptoms. Employees from other floors made similar complaints at later dates. However, the complaints were more numerous and more intense from employees on the third floor.

The employees who were affected pointed to the black deposit on the air supply slits in the ceiling as evidence of a health hazard in the office air. They also indicated that the air often felt dry and stale during winter months.

. . . / 2

2. Description of Building

The Administration Building consists of seven stories, each measuring roughly 25 by 40 metres, built in 1976. It accomodates approximately 200 employees engaged in office type work in a mixture of open and closed areas. Although the majority of employees work during regular daytime hours, some work late hours in support of nightime programs.

The building is ventilated by a high pressure system rated at 60,000 cubic feet per minute (cfm). During winter at least 10 percent of the air is fresh air taken from over the link joining the Administration Building and the studios, and the balance is recirculated air. All the air is filtered through high efficiency filters and can be humidified, if necessary. The air is delivered and exhausted through separate openings in the ceiling.. All the windows are permanently sealed.

A gas fired hot water system is used to heat the building. The heating plant is situated in an adjacent building. Its chimneys are about 40 metres to the west, and exhaust at the same level, as the fresh air intake.

Over the years a black deposit developed on the air supply slits. These deposits were recently brushed off.

3. Standards for Physical Agents and Chemical Substances in the Workroom Environment

The Public Works Canada Space Environment Standards (MD 15000, 79-01-02) provide general guidelines for comfort

conditions in offices. They specify the range of the comfortable temperature as 19 to 26°C (66 to 79°F), the comfort relative humidity range as above 20 percent, and a fresh air requirement of 7 litres per second per person (15 cfm/person).

Occupational exposure to chemical substances is regulated under the Canada Dangerous Substances Regulations of the Canada Labour Code. The maximum permissible exposure levels (known as Threshold Limit Values - TLVs) of the substances pertinent to this survey are given in Table 1. These values represent the time-weighted average concentration for a normal 8-hour workday or 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

4. Survey Procedures

The temperature and relative humidity were measured using a Bristol Model 4069TH portable thermohumidigraph.

The apparatus used to collect the air samples and the analytical methods used to analyze them are given in Table 2. The samples were analyzed by Labour Canada.

The air was also analyzed using a Miran-1A portable infrared analyzer.

Two bulk samples, one of dust that had collected on the air supply slits and one of dust retained by the filters of the ventilation system, were analyzed by emission spectroscopy by a commercial laboratory.

Table 1

TLVs of Pertinent Substances

Substance	TLV
Total Nuisance Dust	10 mg/m^3
Airborne Fibres, as Asbestos	2 fibres/cc
Carbon Monoxide	50 ppm
Formaldehyde	3 mg/m^3
Organic Solvents	Depends on exact compound

Table 2

Sampling Equipment and Analytical Methods

Substance	Type of Pump	Sampling Head	Analytical Method
Total Nuisance Dust	Bendix BDX-44	Membrane Filter	Gravimetric
Airborne Fibres	Bendix BDX-44	Membrane Filter	NIOSH No. 239
Carbon Monoxide	Sipin SP-2	Long Term Detector Tube	Drager (50/a-L)
Formaldehyde	Bendix BDX-44	Impinger	NIOSH No. 125
Organic Solvents	Sipin SP-2	Charcoal Tube	NIOSH No. 127

5. Results

Two floors were selected for measurements: the third because it had the most complaints and the seventh because it had none.

The temperature and relative humidity in the third floor was measured continuously for five days. Table 3 summarizes the results of these measurements. The PWC Standards recommend a temperature range of 66 to 79^{o}F and a relative humidity of over 20 percent.

The elemental analysis of the two bulk samples of dust produced the results given in Table 4. It is seen that the two dusts differed significantly in their composition, particularly in their silicon content. The high silicon content in the dust from the air filters is characteristic of "street dust" while the high carbon content in the dust from the air supply slits is consistent with tobacco smoke.

The evaluation of airborne dust concentrations yielded the results given in Table 5. These results show that the maximum total dust concentration recorded, 0.3 mg/m^3, was only 3 percent of the permissible limit for occupational exposure to nuisance dust, 10 mg/m^3.

Table 6 shows the results of measurements for the total fiber concentration in the air. The analytical method available for this type of hazard does not identify the fibers. Therefore, the interpretation should be based on the assumption that the fibers were asbestos fibers. This assumption will cause any error to be on the safe side. The highest result was 0.12 fibers/cm^3 while the TLV for asbestos is 2 fibres/cm^3.

Table 3

Summary of Temperature and Relative Humidity Measurements
Taken Outside Room 316A

Date (Jan. 1980)	Temperature (^{o}F)	Relative Humidity (Percent)
21	71-74	25-33
22	72-73	27-28
23	70-75	24-37
24	69-74	22-30
25	71-74	26-30

Table 4

Elemental Composition of Bulk Dust Samples

Element	Percent	
	Dust From Supply Air Slits	Dust From Air Filters
Aluminum	3	3
Barium	.1	.05
Boron	.05	.05
Calcium	5	10
Copper	.02	.03
Iron	2	3
Lead	.2	.2
Magnesium	1	2
Manganese	.1	.1
Molybdenum	-	.002
Nickel	-	.005
Phosphorous	1	1
Silicon	3	15
Sodium	1	1
Titanium	.3	.3
Zinc	1	.5
Zirconium	-	.05
Carbonaceous Matter	40	"major constituent"

Table 5

Total Dust Concentrations in Air

Item No.	Sample No.	Date (Jan.1980)	Sampling Location	Type of Sample	Sampling Period	Total Dust Concentration (mg/m^3)
1	180-A-20	30	Room 316A	Area	9:16-15:02	0.0
2	180-A-16	30	Room 725	Area	9:50-15:11	0.3
3	180-A-17	31	Corridor, Outside Room 307	Area	9:15-15:08	0.1
4	180-A-23	31	Room 721	Area	8:51-14:48	0.1

Table 6

Total Fiber Concentrations in Air

Item No.	Filter No. (2-80-A-)	Date (Jan.1980)	Sampling Location	Type of Sample	Sampling Period	Total Fiber Concentration (fibers/cm^3)
1	5	30	Room 316 A	Area	9:22-15:01	0.05
2	1	30	Room 725	Area	9:59-15:12	0.11
3	4	31	Corridor, Outside Room A326	Area	9:17-15:05	0.09
4	3	31	Room 721	Area	8:56-14:50	0.12

The levels of carbon monoxide in the air were found to be well below its TLV of 50 ppm (see Table 7). Suspected sources of it were smoking, heating plant emissions and motor vehicles. The highest recorded value (3 ppm) was obtained in the office of a smoker.

Polymers based on formaldehyde, which are widely used in commercial products, have been suspected of releasing formaldehyde into the air. Therefore, the air was sampled for formaldehyde. The concentrations ranged from 0.001 to 0.015 mg/m^3. The TLV for formaldehyde is 3 mg/m^3. Particulars about the samples can be found in Table 8.

Fluids used to correct typing errors and glues are common office items which can introduce organic solvents into the air. Table 9 shows that no organic solvents were actually detected in the air at sensitivities equivalent to small fractions of the TLVs.

On February 11, 1980 the office air was analyzed using a Miran-1A portable infrared analyzer. It is capable of detecting ppm levels of almost all vapours and gases. The recordings obtained with this instrument indicated that the office air was indistinguishable from outside air.

During the survey the wind blew from the north at 10-40 km/hr. The exhausts from the heating plant chimneys were blown clear of the air intake to the Administration Building.

. . . / 12

Table 7

Carbon Monoxide Concentrations in Air

Item No.	Sample No.	Date (Jan.1980)	Sampling Location	Type of Sample	Sampling Period	Carbon Monoxide Concentration (PPM)
1	CO-1	30	Room 316 A	Area	13:15-15:00	2
2	CO-2	30	Room 725	Area	13:22-15:08	3
3	CO-6	31	Corridor, Outside Room 316 A	Area	11:05-15:06	2
4	CO-3	31	Room 721	Area	8:45-10:50	2
5	CO-5	31	Room 721	Area	10:52-14:46	2

Table 8

Formaldehyde Concentrations in Air

Item No.	Sample No. (580-A-)	Date (Jan.1980)	Sampling Location	Type of Sample	Time of Sampling	Formaldehyde Concentration (mg/m^3)
1	26	30	Room 316 A	Area	9:08-14:56	0.001
2	23	30	Room 725	Area	9:41-15:14	0.015
3	24	31	Corridor, Outside Room 321	Area	9:20-15:10	0.001
4	22	31	Room 721	Area	8:48-14:45	0.003

Table 9

Concentrations of Organic Solvents in Air

Item No.	Sample Number	Date (Jan.1980)	Sampling Location	Type of Sample	Sampling Period	Organic Solvent Concentration (mg/m^3)
1	CT-1	30	Room 316 A	Area	9:13-13:13	N.D.*
2	CT-2	30	Room 725	Area	9:46-13:20	N.D.
3	CT-3	31	East Corridor, Outside Room 316 A	Area	9:10-11:02	N.D.
4	CT-4	31	Room 721	Area	11:10-13:48	N.D.

* N.D.: None detected

6. Conclusions

1. The temperature and humidity during the survey were within the comfort range.

2. The measured concentrations of airborne contaminants were within permissible limits.

3. The black deposit which developed on the air supply slits was probably impinged tobacco smoke.

Appendix "A"

Participants at meeting held at CBC Administration Building, 250 Lanark Avenue, Ottawa, on December 13, 1980:

1. R.C. Wilson, Safety Officer, CBC

2. Michèle Morisset, Nurse, CBC

3. René Greco, Building Superintendent, CBC

4. Léo Rathier, Manager, Electrical and Mechanical Building Services, CBC

5. Dr. J. Mercier, Senior Medical Consultant, Labour Canada

6. S. Potvin, Labour Affairs Officer, Labour Canada

7. A. Pighin, Industrial Hygiene Engineer, Labour Canada

Appendix "B"

Labour Canada Personnel Involved with Survey

The air samples were collected by:

1. S. Potvin, Labour Affairs Officer, Ottawa District Office, Great Lakes Region; and

2. A. Pighin, Industrial Hygiene Engineer, Occupational Safety and Health Branch (OSHB).

The samples were analyzed by:

1. L. Stukel, Industrial Hygiene Laboratory Technician, OSHB; and

2. C. McKenzie, Industrial Hygiene Laboratory Technician, OSHB.

The report was written by A. Pighin and is approved by G.E.S. Ayer, Chief, Technical Services, OSHB.