CAMBRIDGE PUBLIC SCHOOLS
159 THORNDIKE STREET CAMBRIDGE, MASSACHUSETTS 02141

May 15, 1990

Air Quality Status Report - May 15, 1990

Please be notified that; the following is a status report on various elements of the air quality project in the high school and elementary schools as of May 15, 1990.

1. CRLS Ventilation System Modifications and Upgrades - Environmental Health Engineering has completed the specifications for system upgrades and corrective measures to be done this summer. The specifications have been sent out to bid through the Central Registry with an expected cost of $300,000, to be funded from the Air Quality capital project. Work to be done includes;

a. Replace heating coils in all 127 univents in the school to allow for increased fresh air to meet the 15 CFM requirement during winter months.

b. Replace 13 reheat coils to provide higher capacity.

c. Relocate exhaust fan system for welding shop to rooftop, away from intake ducts.

d. Redirect flow of garage exhaust from rooftop ducts.

It is projected that this work will begin this summer and continue through the fall.

2. Elementary Ventilation System Cleaning and Rehabilitation Work - Kitchen Exhaust Inc, who did the high school work, has completed a thorough cleaning of unit ventilators and fans in schools where extensive operational problems were identified. These include the Morse School, Fitzgerald School, and all classrooms at the King School. They are currently working on the corridor units at the King School, and are then scheduled to work on the Harrington, Tobin, Peabody, and Kennedy. Because of access problems with unit ventilators, the Tobin work will not begin until school is out. The other schools that were inspected will require some additional work but did not have the same level of work as the schools mentioned. Attached is a copy of the report prepared for the Fitzgerald School at our request.

3. Preventive Maintenance Plan - EHE is finalizing its draft preventive maintenance plan for all schools and will be submitting the plan for review in early June. This will be transmitted to the School Committee when received.

Respectfully Submitted;

Mary Lou McGrath, Jr.
Superintendent of Schools

Attachment: Fitzgerald School Report from EHE dated 4/27/90

Assessment Of Air Quality And Ventilation Systems At The M.E. Fitzgerald School, Cambridge, Massachusetts

Prepared For:

Ms. Mary Lou McGrath
Superintendent
Cambridge Public Schools
159 Thorndike Street
Cambridge, MA 02138

Prepared By:

Environmental Health and Engineering, Inc.
7 Wells Avenue
Suite 2
Newton, MA 02159

April 27, 1990

1.0 Executive Summary

OBSERVATION:

1. Four unit ventilators were opened and inspected for overall cleanliness and pneumatic/mechanical control operations. These unit ventilators were located in rooms 3, 16, 21 and 27. The unit ventilators inspected were dirty with quite a bit of dust/dirt buildup throughout. The unit ventilator filters were also dirty.

RECOMMENDATION:

Thoroughly clean all unit ventilators and replace both return air and outdoor air filters. Adopt a maintenance schedule for unit ventilator cleaning and filter replacement. It is recommended that filters be replaced at least three times per year.

OBSERVATION:

2. During the site visit, many rooms were entered to observe unit ventilator operating status. It was found that many of these units were turned off. The units were turned off by means of a manual off/on switch located on the front of each individual unit. It was reported that many teachers turn off the unit when the space gets uncomfortably hot.

RECOMMENDATION:

The shutting off of unit ventilators should not be used as a strategy to cool or to maintain temperature control of a space. When unit ventilators are turned off i.e.,to prevent coil freezeups, outdoor air dampers close and heating coil valves open. This may result in additional heating burdens on the space. Controls should be checked in rooms experiencing problems with overheating to insure their proper operation.

OBSERVATION:

3. The outdoor air damper motor motor in room 27 was inoperable due to a disconnected pneumatic supply line. It was also noted that other rooms were experiencing problems with outdoor air damper operation. Some dampers would not modulate to full open position when controls were set to cool the space. This problem may be due to obstructions blocking damper operation, damper motor linkage problems or ungreased, dirty damper bearings.

RECOMMENDATION:

Reconnect pneumatic supply line to its respective damper motor, and check for proper operation. Other units should be inspected and dampers cleared of obstructions, motor linkages adjusted to their proper setting and damper bearings greased. This should also be included as part of a unit ventilator preventive maintenance schedule.

OBSERVATION:

4. Air Handling units are used to ventilate the gymnasium, auditorium, cafeteria and other spaces in this building. It was observed that some of these air handling units are not operating. This may be due to worn or broken fan belts, blown fuses, electrical problems or defective motors.

RECOMMENDATION:

All air handling units should be cleaned and filters replaced. Fan belts should be checked for wear and proper tightness and fuses and motors checked for problems which may exist. Upon completing these actions and making necessary repairs, units should be tested to insure design specifications are met and all units should be put into the preventative maintenance schedule.

OBSERVATION:

5. It was found that several exhaust fans were not operating. Fan belts were either worn out or were missing altogether. Other exhaust fans inspected had belts, but were still inoperable. Motors may be burned out or electrical problems may exist.

RECOMMENDATION:

Replace all worn belts and install belts to exhaust fans found without them. Correct other operating problems so as to meet design specifications of the exhaust system.

OBSERVATION:

6. Somewhat elevated levels of penicillium were found in Room 21.

RECOMMENDATION:

Although the level of this commonly occurring indoor mold was not exceptionally high, it did exceed background. A visual inspection of the room should be made to isolate potential sources. Particular attention should be given to water damaged woodwork, ceiling tiles and paper.

OBSERVATION:

7. Levels of volatile organic compounds measured in Room 21 were found to be well within all acceptable indoor air quality guidelines.

RECOMMENDATION:

None required

2.0 Introduction

This report summarizes the results of an inspection and sampling program designed to assess the adequacy of ventilation in the M.E. Fitzgerald School in Cambridge, Massachusetts.

The M.E. Fitzgerald School is divided into four sections which enclose 77,600 square feet. Building "A", building "B" and building "C" make up the original complex, which was opened in 1956. An addition, located on the south side of the building, was opened in 1965.

On March 29, 1990 a site survey was conducted where measurements of CO_2, temperature and relative humidity were made by EHE personnel. An inspection of four representative unit ventilators was made to assess their operational status, overall cleanliness and their potential for harboring bacteriological contaminants. Air samples were collected from selected locations to assess the presence of airborne microbiological contaminants and volatile organic compounds (VOCs).

During the week of April 9, 1990 a site survey was conducted to assess the operational status of air handling units and unit ventilators.

On April 20, 1990 a site survey was conducted to assess the operational status of exhaust fans located throughout the building.

3.0 Ventilation System

Building "A", "C" and the 1965 addition are used as administrative offices, library, staff offices and classrooms. These sections are ventilated by unit ventilators located in each room. These unit ventilators use hot-water, which is modulated by pneumatically controlled valves to maintain the temperature in the space. These unit ventilators are equipped to supply air from outdoors through the use of pneumatically controlled outdoor air dampers. The unit ventilators are controlled using individual space thermostats located in each room. These space thermostats are operated at a setpoint temperature at which the space is to be maintained. When the space is at some temperature lower than the thermostat setpoint temperature the outdoor air damper will modulate to a closed position and the hot water heating valve will open. As the room temperature rises the outdoor air damper opens and the hot water heating valve begins to modulate closed. This heating valve will continue to modulate closed until the room temperature reaches the thermostat setpoint temperature. At this point the valve will be fully closed. At some space temperature higher than thermostat setpoint temperature the hot water heating valve will be closed and the outdoor air damper will be fully open, providing the space with cooler outdoor air.

Building "B" is used for locker rooms, gymnasium, cafeteria, auditorium and other non - classroom uses. This building is ventilated using eight air handling units located in the building fan rooms. These air handling units are equipped to supply outdoor air through the use of pneumatically controlled outdoor air dampers. These air handling units use hot water for heating.

Exhaust grills are located in all classrooms, offices and other non classroom areas. The air is exhausted through ducts connected to exhaust fans located on the roof of the building.

Four unit ventilators located in rooms 3, 16, 21 and 27 were opened and inspected to assess overall unit cleanliness and pneumatic/mechanical operation. These unit ventilators were found to be dirty, with the exception of room 21, which was relatively clean when compared to the others. It was reported that this particular unit ventilator was cleaned and the filters replaced during the Christmas break. The filters in the other units were dirty and in need of replacement. Visual observations confirmed that damper linkages controlling the outdoor air damper were all connected and operational in three of the four units inspected. The outdoor air damper motor in Room 27 was inoperable due to a disconnected pneumatic supply line.

During the second site survey, 17 unit ventilators and seven air handling units were inspected for operational status. It was noted that many of these unit ventilators had been turned off by means of a manual off/on switch located on the front of each unit ventilator. It was learned that many of the teachers turn off the unit ventilators when their room gets uncomfortably hot. When these units are turned off, the outdoor air damper closes and the heating valve opens. This operational sequence is to prevent the unit from freezing in the winter. However, because of this no outdoor air will enter; air circulation will be reduced and, due to the hot water valve being open, the space will continue to heat.

Three air handling units were observed to be inoperable. These units are used to ventilate areas in building"B".

Several exhaust fans were not operating. Fan belts were either worn out or missing from the units altogether. Other exhaust fans inspected had belts, but were still inoperable. Motors may be burned out or electrical problems may exist.

A list of these problem units will be submitted to the school department for repair.

4.0 Environmental Measurements

4.1 Carbon Dioxide Measurements

Carbon dioxide (CO_2) measurements were taken at various locations in the occupied space at the M.E. Fitzgerald School on 29 March, 1990. The dominant source of CO_2 observed in indoor locations is from the exhaled breath of human occupants. Monitoring the CO_2 concentrations at various locations in the building, and noting the number of occupants present, provides a surrogate measurement of the amount of outdoor air ventilating the space.

CO_2 measurements were made using a GasTech Model RI-411 Portable CO_2 monitor. This instrument was zeroed prior to each use with a soda lime scrubber, and calibrated using Certified Gas Standards.

CO_2 measurements were sequentially made in a number of locations. By repeating these measurements through the day we could observe any changes occurring over time due to either variation in occupant loading or ventilation system operation.

4.2 Speciation of Volatile Organic Compounds

A sample for airborne volatile organic compounds (VOCs) was collected on March 24, 1990 in Room 21 of the Fitzgerald School in Cambridge, MA. The sample was collected on Tenax sorbent and analyzed using gas chromatography/mass spectroscopy by Performance Analytical Inc., of Canoga Park, CA. The procedure described in the Environmental Protection Agency's TO-1 method was used for sampling and analysis.

4.3 Analysis for Fungi and Bacteria

Sampling for airborne microorganisms in the Fitzgerald School buildings was carried out using an Andersen N6 impactor. Three locations were chosen for sampling. The sampling was conducted on Friday, 29 March 1990. Samples were collected on malt extract agar and triptokaye soy agar (TSA) and sent to the University of Michigan for culturing and analysis by Dr. Harriet Burge. The results are presented in Table 3.

Malt extract agar is used for the detection and enumeration of fungi. Malt extract agar has several benefits for culturing fungi, including:

1. It is a diagnostic media for the identification of Aspergillus species,
2. It does not support growth of most bacteria.

TSA is used to culture bacteria and thermophylic actinomycetes. In general, bacteria found indoors are derived from interior sources and human activities. Fungal spores occur naturally outdoors; however, if proper conditions are present indoors, fungi can flourish and serve as a major source of contamination. In general, the evaluation of fungal spores is done by comparing indoor levels to those found outdoors. In this manner, possible amplification of fungal spores from interior reservoirs can be detected. It is also important to compare the relative rank order of taxa found indoors to those found in outdoor samples to assess the possibility of indoor contamination.

5.0 Results of Survey

5.1 Carbon Dioxide

The results of the survey are tabulated in Table I. As a point of reference, the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) recommends levels of 1000 parts per million by volume (PPM_V) of CO_2 as the acceptable limit in enclosed spaces[1]. This value corresponds to approximately 15 cubic feet per minute (CFM) of outside air per person supplied to occupied spaces. For spaces used as classrooms ASHRAE 62-1989 recommends 15 CFM/person, whereas the Commonwealth of Massachusetts requires 10 CFM/person.

Review of CO_2 measurements indicates that adequate ventilation is supplied to most spaces, as currently occupied, to meet ASHRAE 62-1989. For the 56 CO_2 observations made during this survey, the CO_2 concentrations measured ranged from 300 PPM_V to 1140 PPM_V, with the average value of 600 PPM_V, well within the recommended ASHRAE guideline of 1000 PPM_V. The one exception to this is Room 32, which exceeded the 1000 ppm guideline. Furthermore, one observes that the concentration of CO_2 is increasing over the day, indicating inadequate outside air delivery to this room to meet the guideline of 15 CFM/person. Health effects, including headaches and nausea, associated with elevated CO^2 levels are not thought to occur until CO_2 levels reach about 7500 PPM_V. Offensive levels of bio-effluents are usually indicated by CO_2 levels in excess of 1000 PPM_V.

5.2 Volatile Organic Compound Speciation

As can be seen in Table II, many of the 41 VOCs speciated were found to be below the limits of detection. All of the compounds were found in concentrations that are comparable to those found in similar spaces. These concentrations can be compared to three different guidelines, those of the Occupational Safety and Health Administration (OSHA), the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), and the World Health Organization. Table III lists these guidelines. Please note that Table II is presented in ppb, while Table III is presented in ppm (1000 ppb = 1ppm). It is evident that none of the listed guidelines are surpassed by the concentrations measured in Room 16 of the Fitzgerald School.

5.3 Analysis for Fungi and Bacteria

The results reported in Table IV indicate that there is probably a source of Penicillium in Room 21 of the Fitzgerald School. The level measured, although not exceedingly high, is well above background and warrants further assessment. Penicillium is a commonly occuring mold and isolations often dominate indoor collections, so it is often considered an "indoor" fungus group. Generally mold growth will follow a "water disaster" and Penicillium will rapidly cover damp leather, cotton and paper. Although this mold is generally not considered hazardous from a common health effects standpoint, it can exacerbate a response in an individual that is sensitive to it. A visual survey should be performed in this room to locate possible sources, i.e. water damaged areas, and a clean-up and removal performed.

The Cladosporium measured in the outdoor sample (FS-006), although high is not unusual. Cladosporium species are the most frequently recovered taxa in both indoor and outdoor samples. It results from the decay of organic matter such as leaves. The levels of fungi and bacteria measured on plates FS-003 and FS-004 are well within normal limits and do not indicate any unusual or hazardous taxa present.

Two plates, FS-002 and FS-006 each had one large colony spreading across the plate indicating probable contamination in the preparation or handling of the plate rather than airborne contamination.

6.0 Visual Inspection of Chemical Supplies

The storage of chemicals in the "prep" room was also investigated. A locked chemical storage safety cabinet in the prep room was found to contain a variety of salts, bases and an acid. The small room behind Room 16 had a cabinet containing alcohols and kayro syrup. Storage in Room 21 was dedicated to only water-based art supplies.

Under the present conditions the chemicals stored in these three areas do not pose a direct health threat. All containers were found to be intact with tightly fitting covers. If someone were to breach the security of the cabinet in Room 16 and disturb the chemicals, problems may ensue. It is therefore recommended that if the chemicals are not routinely used, they should be relocated to the High School. If the chemicals are used on a regular basis the acids and bases should be stored in separate and secure cabinets. It is a good practice to routinely consider chemical usage and remove all extraneous materials to secure storage for disposal.

Table I CO2 Measurements Fitzgerald School.

LOCATION	CO2 Concentration (PPM)	Temperature (F)	Relative Humidity (%)	People Present
Cust. Office	300	78	8	1
1	720	80	9	24
3	660	78	11	0
Shop Area	540	76	11	13
8	480	75	12	1
9	360	75	12	3
27	480	79	9	0
32	660	77	12	20
5	600	76	11	0
11	660	75	14	7
15	480	75	12	2
16	540	76	11	16
21	840	79	13	20
1	240	77	9	0
3	960	75	15	19
Shop Area	420	75	11	8
8	540	78	14	0
9	720	7	13	15
27	300	8	9	4
32	840	76	14	15
5	720	76	13	20
15	600	75	14	0
16	360	75	11	1
21	540	77	13	0
1	300	76	10	0
3	780	77	15	0
Shop Area	540	75	12	10
8	600	76	14	0
9	600	79	12	0
27	960	79	12	24
32	1080	77	16	17
5	480	76	12	0
15	660	75	14	7
16	660	76	14	23
11	540	75	14	0
21	960	78	16	8
1	720	73	14	22
3	960	74	18	23
Shop Area	660	75	14	9
8	720	76	15	3
9	420	79	12	0
27	960	78	15	22
32	1140	78	16	16
5	660	78	14	18
11	360	78	12	0
15	600	76	13	1
16	360	76	11	1
21	840	78	15	3

Table II. Results of Volatile Organic Compound Sampling.

PERFORMANCE ANALYTICAL INC.

RESULTS OF ANALYSIS

Client: Environmental Health & Engineering

Client Sample ID: 88-022;032890;060

PAI Sample ID: 9001198

Test Code: GC/MS EPA TO-1 | Matrix: Tenax Tube
Analyst: Chris Casteel | Date Received: 03/30/90
Instrument ID: Finnigan 4500A/Tekmar 5010 | Date Analyzed: 04/02/90
Verified by: Michael Tuday | Volume Analyzed: 20.0 Liters

CAS #	COMPOUND	RESULT (UG/M3)	DETECTION LIMIT (UG/M3)	RESULT (PPB)	DETECTION LIMIT (PPB)
74-87-3	CHLOROMETHANE	ND	0.50	ND	0.24
75-01-4	VINYL CHLORIDE	ND	0.50	ND	0.19
74-83-9	BROMOMETHANE	ND	0.50	ND	0.13
75-00-3	CHLOROETHANE	ND	0.50	ND	0.19
75-69-4	TRICHLOROFLUOROMETHANE	0.56	0.50	0.10	0.09
67-64-1	ACETONE	11	0.50	4.5	0.21
75-35-4	1,1-DICHLOROETHENE	ND	0.50	ND	0.13
76-13-1	TRICHLOROTRIFLUOROETHANE	ND	0.50	ND	0.07
75-15-0	CARBON DISULFIDE	ND	0.50	ND	0.16
75-09-2	METHYLENE CHLORIDE	ND	0.50	2.5	0.14
156-60-5	TRANS-1,2-DICHLOROETHENE	ND	0.50	ND	0.13
75-34-3	1,1-DICHLOROETHANE	ND	0.50	ND	0.13
108-05-4	VINYL ACETATE	ND	0.50	ND	0.14
78 03 3	2 BUTANONE	2.5	0.50	0.85	0.17
67-66-3	CHLOROFORM	ND	0.50	ND	0.10
107-06-2	1,2-DICHLOROETHANE	ND	0.50	ND	0.13
71-55-6	1,1,1-TRICHLOROETHANE	2.7	0.50	0.48	0.09
71-43-2	BENZENE	2.3	0.50	0.70	0.15
56-23-5	CARBON TETRACHLORIDE	TR 0.12	0.50	TR 0.02	0.08
78-87-5	1,2-DICHLOROPROPANE	ND	0.50	ND	0.11
79-01-6	TRICHLOROETHENE	1.4	0.50	0.24	0.09
75-27-4	BROMODICHLOROMETHANE	ND	0.50	ND	0.08
10061-01-5	CIS-1,3-DICHLOROPROPENE	ND	0.50	ND	0.11

ND = Not Detected TR = Trace Level; Below Indicated Detection Limit

PERFORMANCE ANALYTICAL INC.

RESULTS OF ANALYSIS (Continued)

Client: Environmental Health & Engineering

Client Sample ID: 90.022.032990.065

PAI Sample ID: 9001198

Test Code: GC/MS EPA TO-1
Analyst: Chris Caotool
Instrument ID: Finnigan 4500A/Tekmar 5010
Verified by: Michael Tuday

Matrix: Tenax Tube
Date Received: 03/30/90
Date Analyzed: 04/02/90
Volume Analyzed: 20.0 Liters

CAS #	COMPOUND	RESULT (UG/M3)	DETECTION LIMIT (UG/M3)	RESULT (PPB)	DETECTION LIMIT (PPB)
108-10-1	4-METHYL-2-PENTANONE	ND	0.50	ND	0.12
10061-02-6	TRANS-1,3-DICHLOROPROPENE	ND	0.50	ND	0.11
79-00-5	1,1,2-TRICHLOROETHANE	ND	0.50	ND	0.09
108-88-3	TOLUENE	36	0.50	9.0	0.13
124-48-1	DIBROMOCHLOROMETHANE	ND	0.50	ND	0.06
591-78-6	2-HEXANONE	ND	0.50	ND	0.12
127-18-4	TETRACHLOROETHENE	1.2	0.50	0.16	0.07
108-90-7	CHLOROBENZENE	ND	0.50	ND	0.11
100-41-4	ETHYLBENZENE	0.58	0.50	0.13	0.11
75-25-2	BROMOFORM	ND	0.50	ND	0.05
100-42-5	STYRENE	TR 0.22	0.50	TR 0.05	0.12
1330-20-7	TOTAL XYLENES	4.9	0.50	1.2	0.12
79-34-5	1,1,2,2,-TETRACHLOROETHANE	ND	0.50	ND	0.07
541-73-1	1,3-DICHLOROBENZENE	ND	0.50	ND	0.09
106-46-7	1,4-DICHLOROBENZENE	1.0	0.50	0.16	0.09
95-50-1	1,2-DICHLOROBENZENE	ND	0.50	ND	0.09
	TOTAL HYDROCARBONS	1000	0.50	400	0.13

ND = Not Detected

TR = Trace Level; Below Indicated Detection Limit

Total Hydrocarbons Quantitated as Toluene

Table III. Current Acceptable Levels for Compounds Measured[1,3]

CAS Number	Target Compound	Common Synonym	TWA[2]		TWA/10[3]	
			ppm	mg/m^3	ppm	mg/m^3
74-87-3	Chloromethane	Methyl Chloride	50	105	5.0	10.5
74-83-9	Bromomethane	Methyl Bromide	5	20	0.5	2.0
75-01-4	Vinyl Chloride		5	10	0.0005	0.001[7]
75-00-3	Chloroethane	Ethyl Chloride	1,000	2,600	100	260
75-09-2	Methylene Chloride		50	175	5	17.5
67-64-1	Acetone		750	1780	75	178
75-15-0	Carbon Disulfide		10	30	0.03	0.1[6]
75-35-4	1,1-Dichloroethene	Vinylidene Chloride	5	20	0.5	2
75-34-3	1,1-Dichloroethane		100	400	10	40
540-59-0	1,2-Dichloroethene (total)	1,2 Dichlorethylene	200	790	20	79
67-66-3	Chloroform	Trichloromethane	2	9.8	0.2	1.0
107-06-2	1,2-Dichloroethane	Ethylene Dichloride	1	4	0.1	0.4
78-93-3	2-Butanone	Methyl Ethyl Ketone	25	120	2.5	12
71-55-6	1,1,1-Trichloroethane	Methyl Chloroform	350	1900	35	190
56-23-5	Carbon Tetrachloride		2	12.6	0.2	1.3
108-05-4	Vinyl Acetate		10	30	1	3
75-27-4	Bromodichloromethane		-	-	-	-
78-87-5	1,2-Dichloropropane	Propylene Dichloride	75	350	7.5	35
10061-01-5	cis-1,3-Dichloropropene		1	5	0.1	0.5
79-01-6	Trichloroethene	Trichloroethylene	50	270	0.185	1[6]
124-48-1	Dibromochloromethane		-	-	-	-
79-00-5	1,1,2-Trichloroethane		10	45	1	4.5
71-43-2	Benzene		1	3[4]	0.0003	0.001[5]
10061-02-6	trans-1,3-Dichloropropene		1	5	0.1	0.5
75-25-2	Bromoform		0.5	5	0.05	0.5
108-10-1	4-Methyl-2-Pentanone	Hexone [MIK]	50	205	5	20.5
591-78-6	2-Hexanone		5	20	0.5	2
127-18-4	Tetrachloroethene	Tetrachloroethylene	25	170	2.5	17
79-34-5	1,1,2,2-Tetrachloroethane		1	7	0.1	0.7
108-88-3	Toluene		100	375	2	7.5[6]
108-90-7	Chlorobenzene		75	350	7.5	35
100-41-4	Ethylbenzene		100	435	10	43.5
100-42-5	Styrene		50	215	0.2	0.80[6]
1330-20-7	Xylene (total)		100	435	10	43.5

(1) Adopted from air contaminants - Permissible Exposure Limits (Title 29 CFR Part 1910.1000) U.S. Department of Labor, Occupational Safety and Health Administration, 1989.

(2) TWA = 8 hour time weighted average.

(3) For indoor air quality guidelines the generally accepted practice is to assume that a concentration of 1/10th of the TLV would not produce complaints in a non-occupational population in residential and office environments (ASHRAE 62-1981R).

(4) Except in Exempt industries.

(5) Benzene has been found to be carcinogenic in humans. The estimated lifetime risk of leukemia is 4 x 10^{-6} at concentrations of 0.001 mg/m^3. (WHO, No. 23, 1987).

(6) Levels recommended by the World Health Organization (WHO, No. 23, 1987) for 24 hour exposure.

(7) Vinyl chloride has been found to be carcinogenic in humans. The lifetime risk is estimated to be 1 x 10^{-6} at 0.001 mg/m^3. (WHO, No. 23, 1987).

Table IV. Results of Airborne Fungi and Bacteria Measurements

Sample #	Medium	Sampling Location	CFU/m^3[1]	Taxa/Plate
FS-001	MEA	Rm. 21	714	101 Penicillium
FS-003	MEA	Rm. 16	7	1 Yeast
FS-006	MEA	Outdoors (near Admin. off.)	1145	110 Cladosporium 11 NS[2]
FS-002	TSA	Rm. 21	---[3]	1 large colony of Rhizopus
FS-004	TSA	Rm. 16	261	31 Bacteria 3 Yeast 1 Penicillium
FS-006	TSA	Outdoors (near Admin. off)	290[3]	38 Bacteria 5 Fungi 1 large bacterium covers much of plate (may be motile)

(1) CFU/ m3 = colony forming units/ cubic meter of air sampled

(2) NS = Non-sporulating fungi

(3) This plate indicates contamination of media through handling or at laboratory

1. S-549

COMMUNICATIONS & REPORTS FROM
CITY OFFICIALS

Communication from Mary Lou McGrath, Superintendent of Schools, transmitting a status report of the Air Quality Project in the High School and the Elementary Schools.

In City Council,

May 21, 1990

Placed on file