Indoor Air Quality Update™

A Guide to the Practical Control of Indoor Air Problems from Cutter Information Corp.

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Portland East Federal Office Building: A Case Study

Researchers studying indoor environments have published few comprehensive assessments of new office buildings. The EPA Public Access Buildings Study (*IAQU*, December 1988) is a notable exception. Now, the National Institute of Standards and Technology (NIST) is publishing the results of a comprehensive study of a new office building in Portland, Oregon. We think this is an extremely important piece of work, and therefore we are presenting the results in detail. They will interest designers, operators, consultants, researchers, and policy makers.

First-year monitoring results from the new federal building indicate that in some new office buildings, building materials and furnishings are far less important contributors to airborne levels of volatile organic compounds (VOC) than are occupant activities. Specifically, copy machines and plotters are major VOC sources. The results also show a strong correlation between ventilation rates and VOC levels: adequate ventilation controls VOC even where source strengths are large.

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Background

Researchers from NIST studied the building for the General Services Administration. The study's purpose was to evaluate the building's thermal and environmental performance, and it included extensive documentation of ventilation rates. The building was constructed during 1986 and 1987 and first occupied in August 1987.

Researchers installed a central diagnostic center. They connected this center through an extensive network of tubes and wires to over 100 monitoring points throughout the building, and measured thermal performance, ventilation, and air contaminants over a one-year period. Another team of researchers from Lawrence Berkeley Laboratory (LBL) made additional VOC measurements on three occasions during early occupancy and again after one year. The NIST research team plans to monitor the building once a year for the next two years. This kind of follow-up will give a good, long-term view of environmental trends in new office buildings.

The results reported here are based on two separate papers (see the references at the end of the article) and on our discussions with the principal investigators for the two research organizations.

The Building

The Portland East Federal Office Building includes seven office stories with a basement and a two and one-half story underground garage. The occupied building area is about 500,000 square feet (~46,000 square meters), with a volume of about 6,356,000 cubic feet (~180,000 cubic meters). A dining room and kitchen attach to the building on the ground floor. The garage connects to the building by several stair and elevator shafts, and a loading dock is located on the first basement level. Figure 1 shows a schematic of the building.

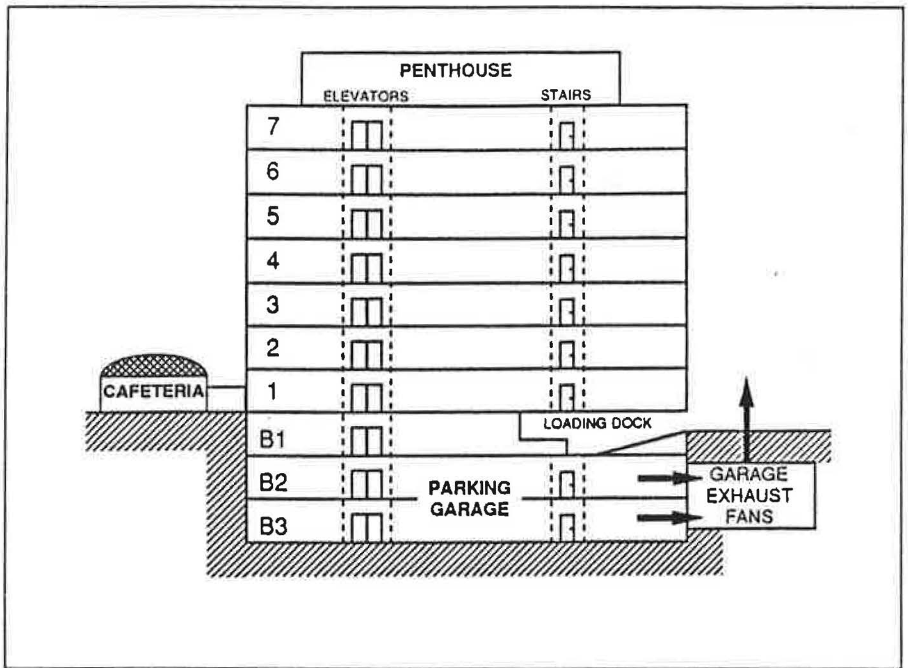

Figure 1 — Schematic of the New Federal Office Building

Three mechanical systems located in a rooftop penthouse serve the east, central, and west portions of the seven office floors. The HVAC systems are the variable air volume (VAV) type, and together they can provide three air changes per hour (ACH) — about 300,000 cubic feet per minute (cfm). Four air handling systems and four exhaust fans ventilate the garages and the loading dock. They activate when carbon monoxide levels exceed 50 ppm.

The offices are mostly open plan with five-foot-high partitions between work stations. Most floors have enclosed offices for supervisors and enclosed conference rooms. All enclosed areas lack separate air handling systems. The second floor contains a computer facility.

Ventilation Rates

Ventilation rates in the Portland building vary between 0.4 and 2.2 ACH when the building is occupied. The low of 0.4 ACH occurs during very hot or extremely cold outside conditions. The building would require 0.7 ACH to meet the new ASHRAE ventilation standard requirement of 20 cfm per occupant, based on 135 square feet of space per occupant. It would require 0.79 ACH based on federal government standards of 120 occupiable square feet (minimum) per occupant.

Building air leakage (uncontrolled ventilation when HVAC fans are off during unoccupied hours) ranges from 0.2 to 0.4 ACH. The building was designed to be energy efficient, but the exterior walls are not tight. The researchers comment that the leakage found in the Portland building can be considered typical of U.S. office buildings (see ***IAQU*** May 1988). They compared the building to a typical home that has an exterior surface to interior volume ratio of six to one. Using that ratio, they say the building walls would be equivalent to the walls of a house with an air leakage of 1.2 to 2.4 ACH.

Figure 2 shows measured air exchange rates for the building with fans on (open diamonds) and off (solid squares). The NIST team obtained these ventilation rates using an extensive set of tracer gas measurements similar to those described in ***IAQU*** May 1989. They injected an inert, buoyancy-neutral gas, sulfur hexafluoride

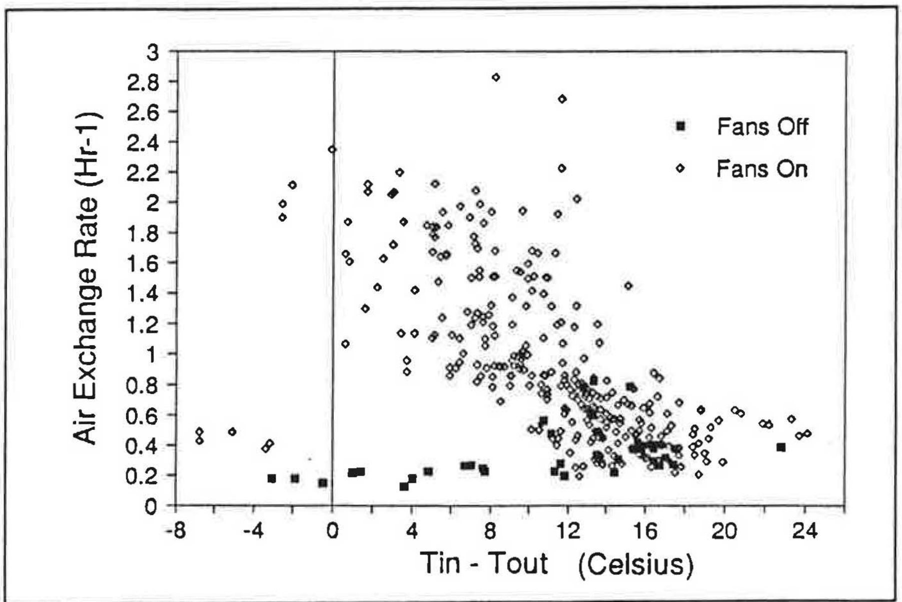

Figure 2 — Air Exchange Rate vs. Inside-Outside Temperature Difference

(SF_6), into the building air supply and allowed it to mix well. Then they collected samples and calculated the ventilation rate based on the decay rate of the tracer gas. This method provides a ventilation rate which includes both mechanical ventilation and air leakage through the envelope.

The researchers obtained another set of ventilation rate data by using carbon dioxide levels and occupant density. The results are consistent with tracer gas measurements and are shown in Figure 3. Analysis of these data show that the air in the building is well mixed and that short circuiting of the air supply is not occurring.

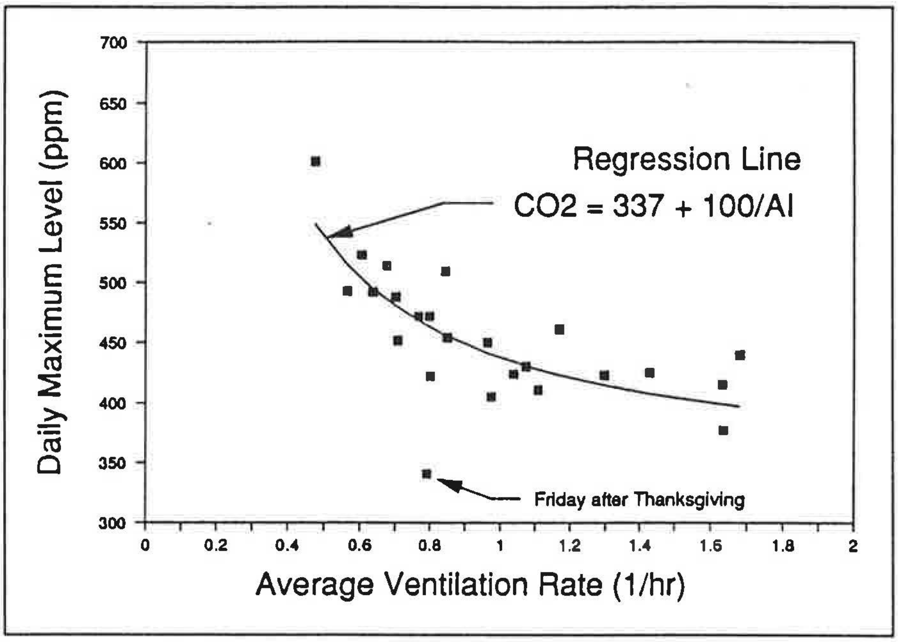

Figure 3 — Carbon Dioxide level vs. Ventilation

Contaminants

Contaminants that the researchers measured included:

- Respirable particles
- Carbon monoxide
- Radon
- Formaldehyde
- VOC

Respirable Particles

Respirable particle levels in six size ranges were measured during portions of September and October 1987 (see Figure 4). Researchers measured the particle levels by using a light-scattering instrument that counts particles in each size range. They found very large numbers of particles of the smallest size measured: 0.3 to 0.5 microns. Typical building media filters do not efficiently remove particles in this size range. These particles penetrate deep into the human respiratory tract, where they can cause serious long-term health problems. This characteristic of the Portland building is not unusual. It simply points out an area where indoor air quality has not been adequately considered when developing design criteria.

Carbon Monoxide

Due to air flow up the elevator shafts and stair towers from the underground parking garage, carbon monoxide (CO) levels in the upper parts of the building frequently exceeded 10 ppm during the fall and early winter. Figure 5 shows daily maximum CO levels in the sixth-floor elevator lobby.

The automated sensors in the garage work as designed, activating exhaust fans when garage CO levels exceed 50 ppm. However, this intermittent operation does not prevent CO transport up the elevator shafts and stair towers during extreme weather conditions when the stack effect is strongest. To remedy the problem, two of the four exhaust fans are operated continuously during building occupancy. The resulting CO levels in the office space did not exceed 5 ppm, the threshold for complaints.

Radon

Researchers measured radon concentrations by using charcoal canisters. They took three-day measurements at interior locations, and measured working levels of radon progeny. The results are shown in Figures 6 and 7.

The levels found in the building do not exceed EPA or ASHRAE guidelines. However, it is noteworthy that the levels in the upper floors of the building were almost as high as the levels in the basement.

EPA plans a radon survey of all federal office buildings. Richard Guimond of EPA's radon program recently told us that his agency plans a survey of commercial building radon levels in the near future. We have written about the potential for elevated radon levels in nonresidential structures (*IAQU*, September 1988), but we did not consider the potential for elevated radon in the upper portions of medium- and high-rise buildings due to the stack effect. The Portland building demonstrates that there is reason to measure radon in taller buildings.

Formaldehyde

The NIST team sampled formaldehyde using a passive monitor based on absorption onto a sodium bisulfite treated filter, and analyzed it by the chromotropic acid colorimetric method. They made ten measurements in August 1987, when furniture was being moved into the building. Carpet tiles had been installed from April to July in most parts of the building. The maximum formaldehyde level they measured was 0.056 ppm, with the remainder of the ten measuring levels less than 0.04

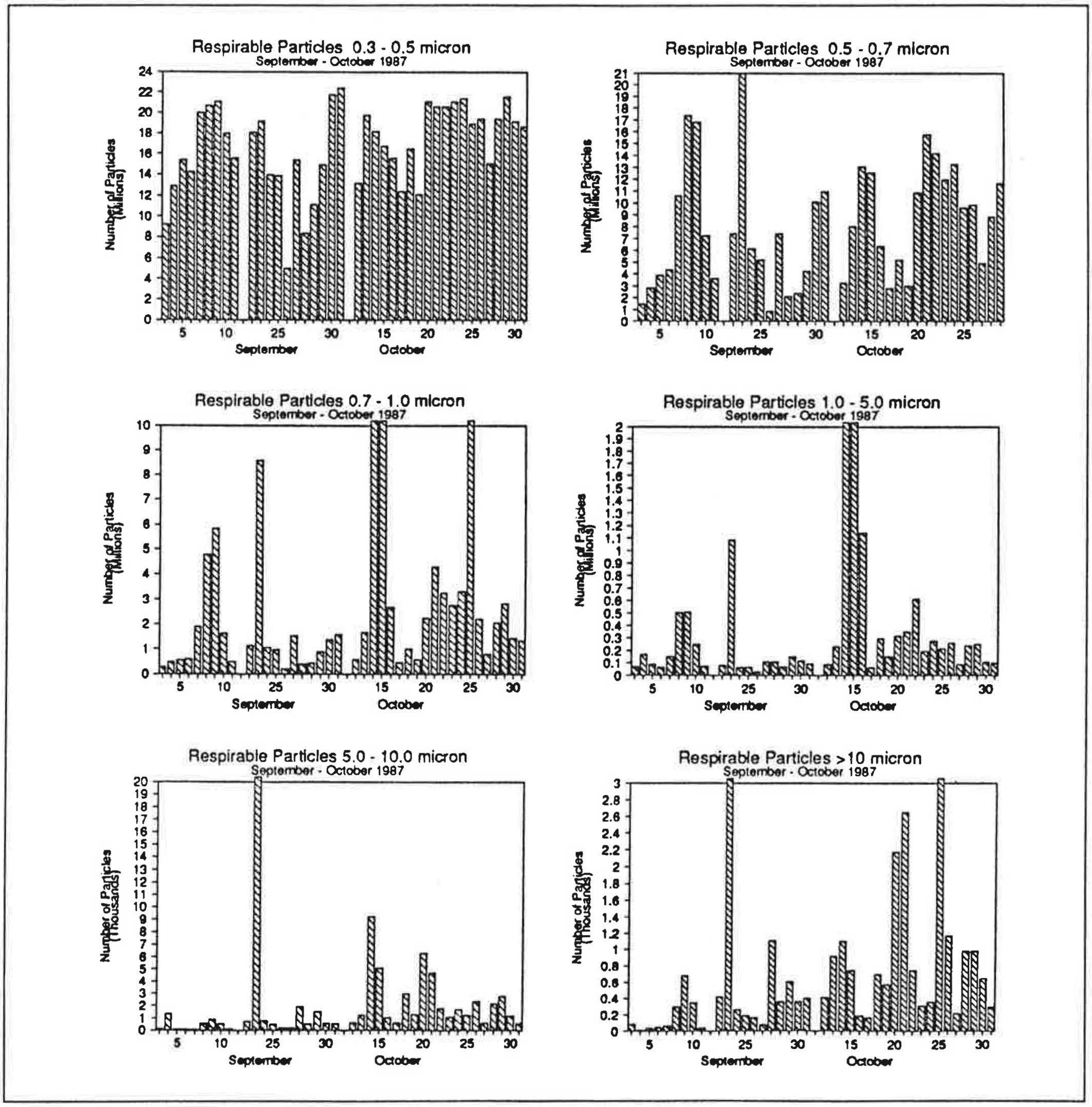

Figure 4 — Respirable Particles in Various Size Ranges for Months of September and October 1987

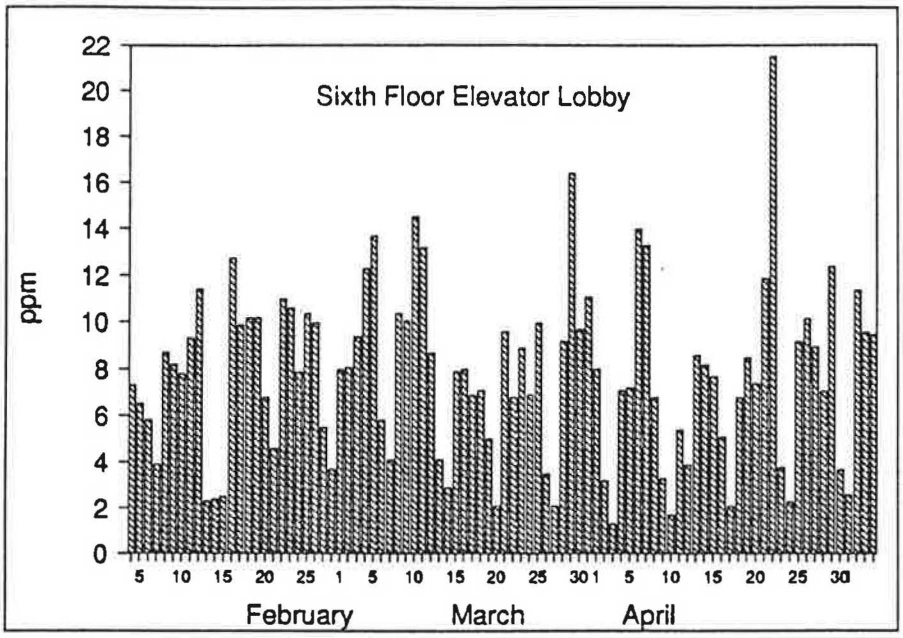

Figure 5 — Daily Maximum Carbon Monoxide Level in Sixth Floor Lobby for Months of February to May

ppm (see Figure 8). This compares to the ASHRAE guideline level of 0.1 ppm. The 0.056 ppm formaldehyde concentration indicates that formaldehyde emissions from building materials and furnishings were not excessive.

VOC

Volatile organic compounds measurements and modelling show clear relationships between source strengths, ventilation rates, and VOC air concentrations. The investigators conclude that occupant activity sources are greater than building material and furnishing sources. The relationships between ventilation rates and VOC concentrations were consistent.

VOC Measurements

LBL scientists measured VOC four times: during move-in (August 4, 1987), ten weeks later (October 14, 1987), 13 weeks later (January 13, 1988), and finally a year later (October 28, 1988). They measured VOC using a sophisticated multisorbent collection system.

VOC analysis was by thermal desorption and concentration, a capillary gas chromatograph equipped with an on-column cryogenic focusing device, and a mass-selective detector. Following thermal desorption, a portion of the sample was split for analysis by a flame ionization detector to measure total organic carbon.

The scientists collected samples (in duplicate or triplicate) from return air shafts at the penthouse level, office spaces, and outdoor air on the roof. Sample volumes were typically one to three liters collected at a rate of 100 cc per minute.

Source Strength Calculations

Researchers calculated source strengths based on measured air concentrations and ventilation rate information. They used a single-equation mass balance. It assumes

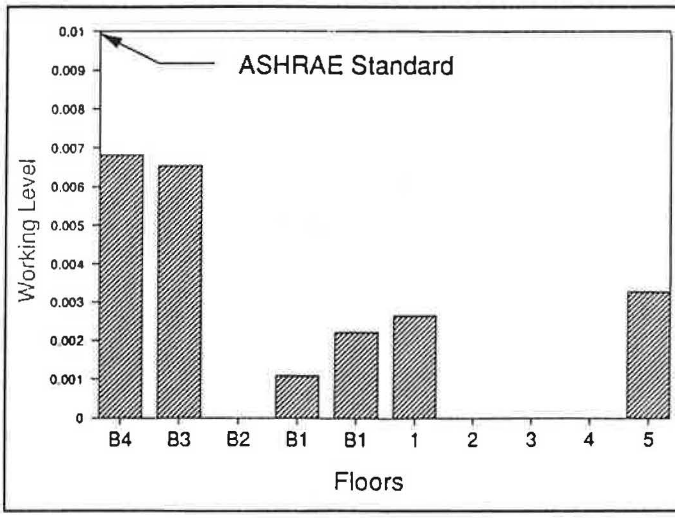

Figure 6 — Working Levels of Radon Daughters

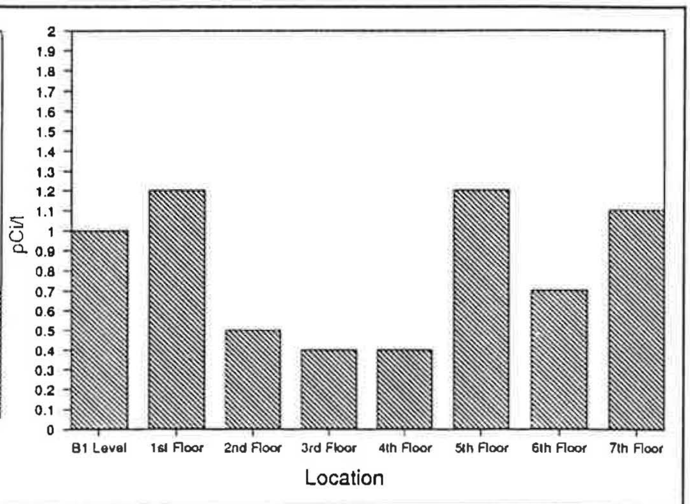

Figure 7 — Radon Levels as Measured with Charcoal Canisters

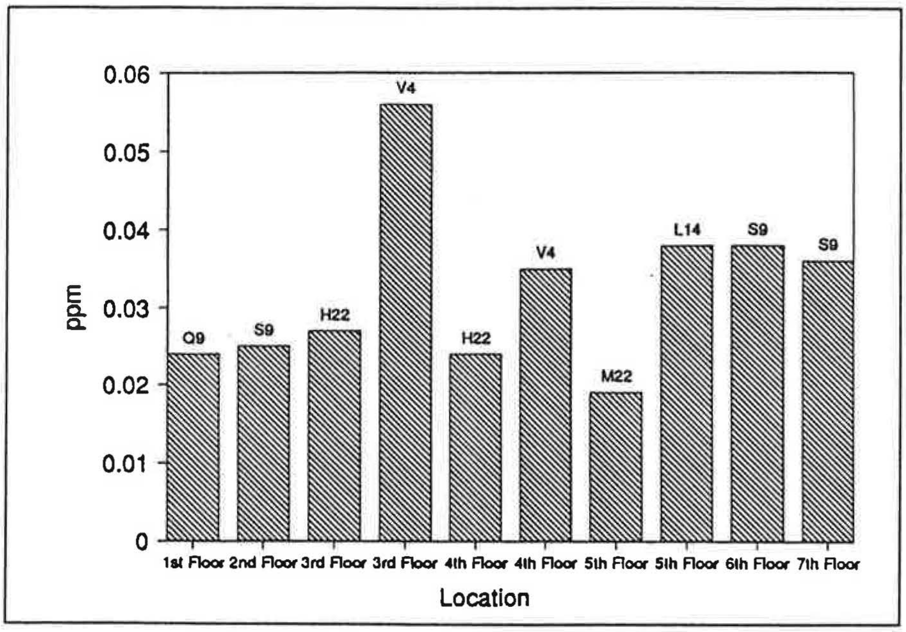

Figure 8 — Formaldehyde Levels in Building

that perfect mixing of air occurs in the indoor environment and that removal mechanisms other than ventilation are neglible. At near steady-state conditions, the source strength, S (mg/hr), of a contaminant equals the product of the ventilated volume (m^3) and the ventilation rate (ACH) times the difference between indoor and outdoor concentrations (C_i - C_o).

$$S = Vol. \times Q (C_i - C_o)$$

$$(mg\ h^{-1}) = M^3 \times AC\ H^{-1}\ (mg/m^3)$$

To facilitate comparison with other buildings, investigators expressed results as specific source strengths: S/V (mg/m^3-h).

Table 1 — Long-term variations in the concentrations and specific source strengths of individual VOC

	CONCENTRATION (ug/m3) *				SP. SOURCE STRENGTH (ug/m3-h)			
Date	8/4/87	10/14/87	1/13/88	10/28/88	8/4/87	10/14/87	1/13/88	10/28/88
Time	20:00	17-19:00	15-17:00	15-17:00	20:00	17-19:00	15-17:00	15-17:00
Vent. Rate	0.5	1.36	0.24	1.99	0.5	1.36	0.24	1.99
COMPOUND								
Oxygenated								
2-Propanol (acetone)	14.8	20.2	137.2	26.5	5.8	21.9	31.6	52.6
2-Propanone	50.1	28.8	66.6	32.4	22.1	27.0	14.9	49.7
2-Butanone	40.9	6.2	15.3	5.7	19.0	2.5	2.0	7.6
Chlorinated								
Dichloromethane	32.4	2.6	13.4	2.7	15.9	1.3	2.7	5.4
1,1,1-Trichloroethane	13.5	13.8	119.7	17.1	5.4	13.6	27.5	27.0
Trichloroethene	16.4	7.2	58.2	14.8	8.2	9.7	11.0	27.6
Aliphatic								
2-Methylbutane	31.9	53.8	81.6	26.2	13.1	31.7	16.1	44.7
n-Hexane	11.3	10.0	24.0	9.2	5.7	6.7	3.7	14.6
Cyclohexane	5.7			2.7	2.4			4.2
n-Heptane	4.8	3.1	12.6	3.6	2.0	2.7	0.2	5.5
3-Methylhexane	6.0	4.0	14.7	3.5	2.4	3.1	0.0	5.2
Methylcyclohexane	5.1			1.7	2.4			2.5
2,2,4-Trimethylpentane	2.4	1.8	8.0	3.0	1.0	1.3	0.7	6.0
1,4-Dimethylcyclohexane	3.1				1.6			
n-Nonane	39.6	10.6	149.1	33.9	19.7	11.4	35.3	63.0
2,2,5-Trimethylhexane	2.4				1.2			
Isopar 2 **	147.0	82.5	638.7	95.4	72.8	104.2	151.7	179.7
n-Undecane	115.6	57.3	831.3	48.3	55.2	71.3	196.8	85.7
n-Dodecane	49.1	10.6	280.8	10.9	21.8	5.9	67.0	17.6
n-Tridecane		6.0	111.9	8.5		5.8	26.2	13.8
n-Tetradecane		36.1	245.3	27.0		43.0	57.9	49.5
Aromatic								
Toluene	60.4	81.3	91.0	33.1	22.7	80.9	13.7	50.2
Ethylbenzene	11.8	7.0	18.7	7.5	5.3	4.9	2.3	11.4
1,2-Dimethylbenzene	17.2	8.7	25.8	8.1	7.6	5.8	4.1	12.0
1,3-,1,4-Dimethylbenzene		18.1	54.5	18.3		11.7	8.8	26.6
1,3,5-Trimethylbenzene	4.1				1.6			
TOTALS								
Sum of Individual VOC	685	470	2998	440	315	466	674	762
Total Organic Carbon	5200	1900	11000	2300	2500	2400	2500	4300

* Average concentration for return-air shafts
** Estimated concentration using n-decane as standard

Table 2 — Concentration of VOC in mechanical system, indoor air and outdoor air on October 28, 1988

	CONCENTRATION (ug/m3)					
	Return Fans			Return		
	East	Center	West	Fan	Floor 5	Roof
Time	15:51	15:16	16:25	Avgerage	15:38	14:42
COMPOUND						
Oxygenated						
2-Propanol	38.8	19.1	21.5	26.5	13.1	0.0
2-Propanone (acetone)	33.9	31.2	32.2	32.4	27.9	7.4
2-Butanone	5.2	5.3	6.6	5.7	5.0	1.9
Chlorinated						
Dichloromethane	2.8	2.7	2.6	2.7	2.0	0.0
1,1,1-Trichloroethane	15.8	18.3	17.2	17.1	15.0	3.5
Trichloroethene	16.0	15.4	13.1	14.8	15.9	0.9
Aliphatic						
2-Methylbutane	30.2	30.2	18.3	26.2	35.8	3.8
n-Pentane	13.2	17.8	11.5	14.2	21.1	2.7
n-Hexane	9.4	9.7	8.4	9.2	10.9	1.8
Cyclohexane	2.8	2.8	2.4	2.7	3.2	0.6
n-Heptane	3.7	3.8	3.3	3.6	3.6	0.8
3-Methylhexane	3.6	3.5	3.3	3.5	5.1	0.9
Methylcyclohexane	1.8	1.8	1.6	1.7	2.0	0.4
2,2,4-Trimethylpentane	3.1	3.1	2.8	3.0	4.4	0.0
n-Nonane	33.2	40.4	28.0	33.9	37.2	2.2
Isopar 1 *	133.6	155.4	134.3	141.1	139.5	7.7
Isopar 2 *	94.5	110.5	81.1	95.4	98.0	5.1
Isopar 3 *	221.1	240.9	198.2	220.1	250.6	11.1
Isopar 4 *	278.5	297.6	248.1	274.8	306.1	13.9
n-Undecane	52.9	47.7	44.5	48.3	56.2	5.3
n-Dodecane	9.9	12.2	10.6	10.9	13.3	2.0
n-Tridecane	7.3	7.6	10.5	8.5	9.5	1.6
n-Tetradecane	28.3	27.4	25.2	27.0	62.3	2.1
Aromatic						
Benzene	15.3	15.0	15.0	15.1	18.7	4.7
Toluene	33.4	34.8	31.1	33.1	41.0	7.9
Ethylbenzene	7.3	7.8	7.3	7.5	7.8	1.8
1,2-Dimethylbenzene	8.2	8.2	7.9	8.1	10.0	2.1
1,3-,1,4-Dimethylbenzene	18.7	18.2	18.0	18.3	24.0	4.9
Methylethylbenzene	11.4	11.1	11.2	11.2	13.6	2.9
1,2,4-Trimethylbenzene	10.6	10.7	10.5	10.6	12.6	2.7
1,4-Diethylbenzene	8.6	8.7	8.5	8.6	9.1	2.1
TOTALS						
Sum of Individual VOC	1153	1219	1035	1136	1275	105
Total Organic Carbon	2348	2537	2061	2315	2163	143

* Estimated concentration using n-decane or n-undecane as standards

Long-term VOC Variations

Table 1 shows the measured VOC levels and calculated source strengths by compound during each of the four sampling periods. Indoor levels were generally between five and twenty times outdoor levels. This is consistent with the work of many other investigators.

However, the oxygenated and chlorinated compounds often found at elevated levels in new office buildings were not found at significant air concentrations. And their concentrations did not vary greatly over time. This suggests that the building materials and furnishings were not significant sources of indoor air contaminants in the Portland building.

Investigators discovered that the dominant VOC were aliphatic hydrocarbons. These compounds are found in a common solvent used as a clear dispersant and toner premix for photocopiers and plotters.

The solvent, Isopar G (Exxon Corp.), consists of a mixture of branched alkanes (C_{10} and C_{11}). This chemical was analyzed by GC/MS (gas chromatography-mass spectrometry) and found to contain at least 20 major compounds. The solvent analysis was comparable to that from indoor air samples, although there were unexplained differences in peak areas in the two analyses.

The LBL investigators stated that the light hydrocarbons such as those in Isopar G are considered to have low toxicity. The occupational exposure threshold limit values for exposure to nonane and gasoline are 200 ppm (1050 mg/m^3) and 300 ppm (900 mg/m^3) respectively. The manufacturer's recommended exposure limit for Isopar G is 300 ppm (~1850 mg/m^3).

Table 2 shows the VOC levels in the mechanical system air, indoor air, and outdoor air on October 28, 1988. Indoor VOC air levels were generally five to twenty times higher than outdoor levels. The results show that aliphatic compounds dominate the measured hydrocarbons.

Investigation of VOC Sources

The researchers investigated copier dispersant and toner premix useage. During a 55-day period, 147 liters were used: an average use of about 2.7 liters or two kilograms per day. Twenty-six copiers and three plotters in the building use this solvent with at least three machines on each floor. While some of the machines are in separate spaces, many are in the open office areas without any special ventilation.

The measured air levels of the toner solvent compounds resulted in a calculated source strength of 2.6 to 4.6 kg/day. The source strength calculations for solvent are in reasonably close agreement with the estimated use of solvent: two kg/day.

It's important that there was close agreement between the results of the investigation into product use and the calculated source strength based on measured air levels. This demonstrates that modelling air levels based on known source strengths is a reasonable approach to predicting estimated air concentrations of VOC. It also suggests the importance and value of source inventories during problem building investigations or during routine building environmental audits.

VOC and Ventilation

Measurements of the total VOC levels (reported as "Total Organic Carbon") during the first few months of occupancy are shown in Figure 9. At the lowest measured ventilation rates of about 0.24 ACH, the VOC levels reached 11 mg/m^3. At 0.5 ACH, VOC air levels were 5.2 mg/m^3, and at 1.36 ACH the VOC concentration was 1.9 mg/m^3. More than a year after initial occupancy, at 1.99 ACH, VOC air concentrations were 2.3 mg/m^3 (not shown on the graph).

There is a direct relationship between ventilation rate and VOC levels when source strengths are constant. However, varying source strengths play an important role. With VOC concentrations dominated by occupant activity-related sources (rather than building materials or furnishings), occupant activity is far more important than ventilation.

At the time of the last sampling period, source strengths were calculated to be much greater than during the three previous VOC sample collection periods. Therefore, the VOC air concentration for the last period falls slightly above the curve plotted in Figure 9. Even so, at this high ventilation rate, the levels of VOC (total and as organic carbon) were still far below the levels when ventilation rates were much lower. This is evidence that adequate ventilation can control VOC even where source strengths are large.

The VOC/ACH Curve Inflection Point

Last month in ***IAQU*** we showed a theoretical curve for the relationship between VOC and ventilation. We said that the inflection point of the curve occurs when ventilation is between 0.6 and 1.2 ACH, depending on the source strengths and sinks. The inflection point is where the slope of the curve changes from a more vertical to a more horizontal line: the point where a tangent to the curve makes a 45° angle with the vertical and horizontal axes.

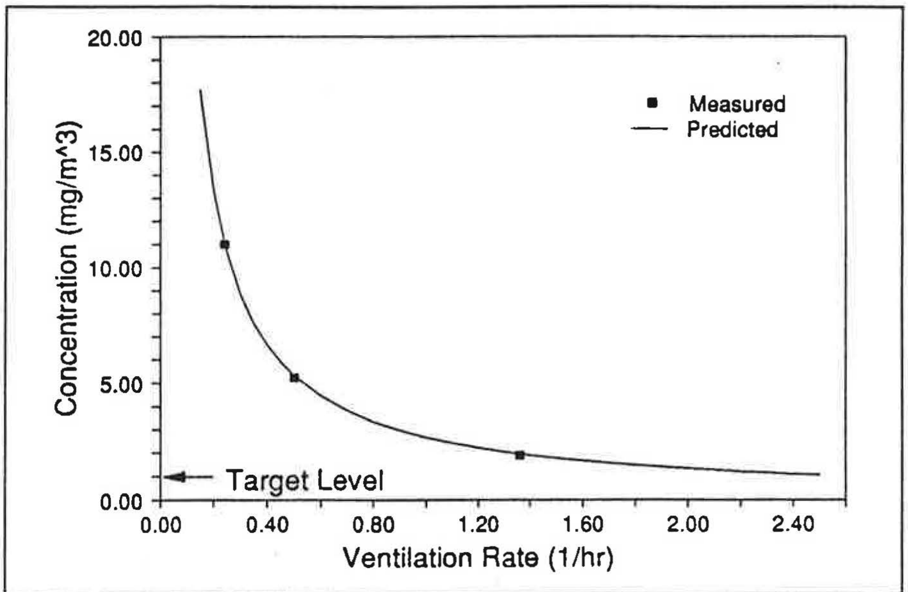

Figure 9 — Total Organic Carbon vs. Ventilation Rate

The results plotted in Figure 9 show a slightly lower inflection point for the Portland East Federal Office Building (around 0.5 ACH). Perhaps this is because the source strengths are fairly small.

The ventilation rate at which the inflection point occurs is important because it tells us when increasing or decreasing ventilation will have a more or less significant impact on VOC levels. At ventilation rates below (to the left of) the inflection point, a small increase in ventilation produces a larger decrease in VOC levels than at ventilation rates above (to the right of) the inflection point.

It is important for building owners and operators to know where their building falls on this curve. This knowledge will help them make economically sound decisions about increasing ventilation in response to complaints or decreasing ventilation to reduce energy consumption. Building designers must consider this factor in developing the design assumptions regarding ventilation system capacity and minimum outside air supply rates.

In many cities, it is important to know when outside air reductions are necessitated by high outdoor CO levels. Under the ASHRAE ventilation standard (62-1981 as well as 62-1981R), building operators may reduce outside air ventilation during elevated CO periods in order to avoid contaminating indoor air. This is because the requirements to clean outdoor air supply to meet ambient air quality standards do not apply in cases where feasible technology is not available. In these cases, regulations allow reduced outdoor air supply instead.

VOC and Their Sources

Table 1 shows the "Total Volatile Organics" by chemical group and compound on four different days. It gives measured concentrations and calculated source strengths for each day with the measured ventilation rates.

Off-gassing of construction materials and furnishings do not appear to be a major source of airborne VOC. Even though researchers monitored the building within a few weeks after construction was completed and while move-in was still occurring, the VOC levels were not remarkably higher during the initial monitoring. According to Al Hodgson of LBL, liquid-process photocopiers and plotters are the most likely sources of the VOC measured there.

Table 2 shows VOC concentrations at various locations in the building and in outside air during the October 28, 1988 monitoring. For most compounds, air concentrations did not vary significantly from one location to another. This suggests that air was fairly well mixed throughout the building, at least when outside air supply was near its maximum level.

Figure 10 graphically illustrates that source strengths were fairly consistent throughout the four sample collection days and that differences in airborne concentrations were primarily a function of ventilation differences.

Conclusions and Implications

We are impressed with how much NIST's work tells us about building design, operation, and use effects on indoor air quality. Following are some of our conclusions about the implications of this work.

Design implications

Designers must separately ventilate and exhaust directly outside all liquid process copiers, plotters, and other devices which are known sources of indoor air contaminants.

If building materials and furnishings are reasonably well selected, conditioned, or treated to control their emissions, then the major challenges for designers will be the following:

- Controlling sources from outside the building (outdoor air quality sensors and control to initiate air cleaning when outdoor air becomes dirty);

- Cleaning and filtration where practical and as required, and modulating outside supply air volumes when outdoor contaminants exceed permissable levels for contaminants for which air cleaning is not practical;

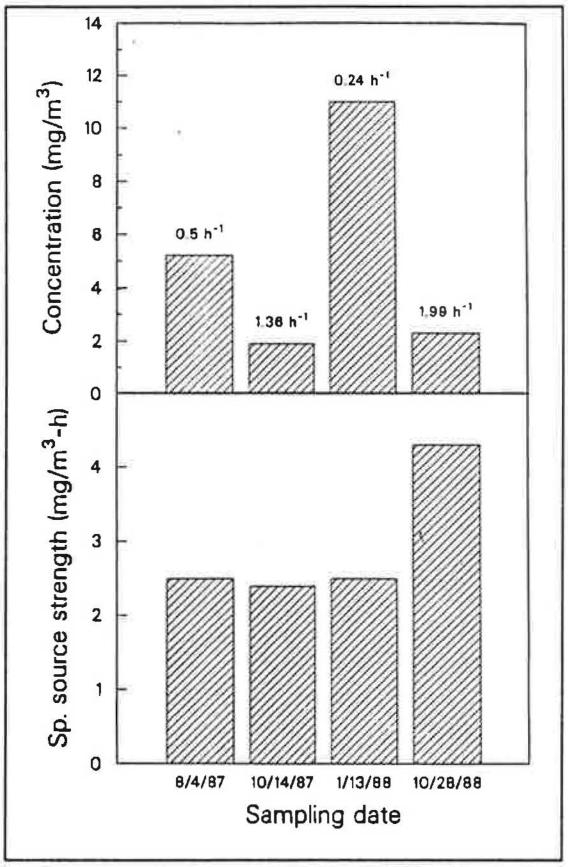

Figure 10 — Long-term Variations in the Concentration and Specific Source Strength of TOC. Ventilation rates are shown above the concentration bars.

- Developing methods to monitor and clean recirculated air when outdoor air supply is reduced;

- Designing ventilation system air distribution to effectively remove contaminants generated by occupant activities at the source;

- Developing methods and procedures for building management and occupants to identify and control contaminant sources related to occupant activities;

- Designing buildings, including parking garages, that carefully protect vertical shafts from vehicle exhaust fumes. Controlling garage CO levels may not be adequate to protect occupants in office spaces from unacceptable levels.

Investigation implications:

- Identify all significant indoor activities involving the use of VOC sources. Determine the chemical composition of the sources and evaluate their potential toxicity or irritation effects on occupants.
- Locate sampling devices so they are not overly affected by known sources. Be sure to characterize worst-case and typical occupant exposures based on known sources. This involves both the proper location and timing of sample collections.

Investigating VOC Sources

Investigating source strengths is a valuable tool for characterizing indoor air contaminants. Based on copier and plotter solvent use, we can reasonably predict that air levels of the solvent compounds will be significant.

Analyzing of a liquid sample prior to an air sample would allow investigators to identify appropriate sampling methods and strategies for the expected compounds. Air samples would serve to confirm the source inventory. Control recommendations would be more fully justified because of the close relationships between solvent use, air levels, and ventilation rates.

- When investigators begin a study of an alleged air quality problem in an office building, we recommend that an inventory of major activities include all supplies regularly purchased for use in the building. This should include office products, printing, mailing, and duplicating materials, etc. It should also include any graphics materials including art supplies, photographic supplies, etc. Particular attention should be paid to any laboratory activities.
- Source strength calculations should be made and a simple air quality model should be used to predict indoor air concentrations. Such calculations will be accurate enough to provide first-order estimates of air quality.

For More Information

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Richard A. Grot, Andrew Persily, Alfred T. Hodgson, and Joan M. Daisey, "Environmental Evaluation of the Portland East Federal Office Building Preoccupancy and Early Occupancy Results." Report NISTIR 89-4066. Gaithersburg, MD: National Institute of Standards and Technology. April 1989.

Available from National Technical Information Service (NTIS), Springfield, VA 22161. Price: $12.95.

A. T. Hodgson, J. M. Daisey, and R. A. Grot, "Source Strengths and Sources of Volatile Organic Compounds in a New Office Building." LBL-26950. To be presented at Air and Waste Management Association, 82nd Annual Meeting, June 25-30, Anaheim, California. Paper 89-80.7. ♦

News and Analysis

ASHRAE Ventilation Standard

ASHRAE Standard 62-1981R is expected to be adopted by the Board of Directors during its meetings in Vancouver this month. If that is the case, it will be in print by late this summer: probably about mid-August. Watch ***IAQU*** for news of the release and related events. ♦

Forum on IAQ Issues

Implementation of the new ASHRAE ventilation standard will be one of the featured topics at "IAQ Update '89," a forum on current issues in the practical control of indoor air quality to be held in Washington, D.C., September 25-26, 1989. See the insert in this issue, or call the publisher for more information: Cutter Information Corp., (617)648-8700. ♦

Lead Paint Law Suit: Another Asbestos?

On June 8, New York City sued five manufacturers of lead paint pigment. According to a story in *Indoor Pollution News*, the suit seeks $50 million in damages for abatement of lead paint in city-owned buildings. The city is trying to hold companies liable for lead paint removal costs and treatment of victims.

This sounds like many of the lawsuits concerning asbestos in schools and public buildings filed by public entities around the country in recent years. The theory is that the manufacturers knew of the hazards, yet they continued to produce and market the products. Cities, states, and school boards have individually and joint-