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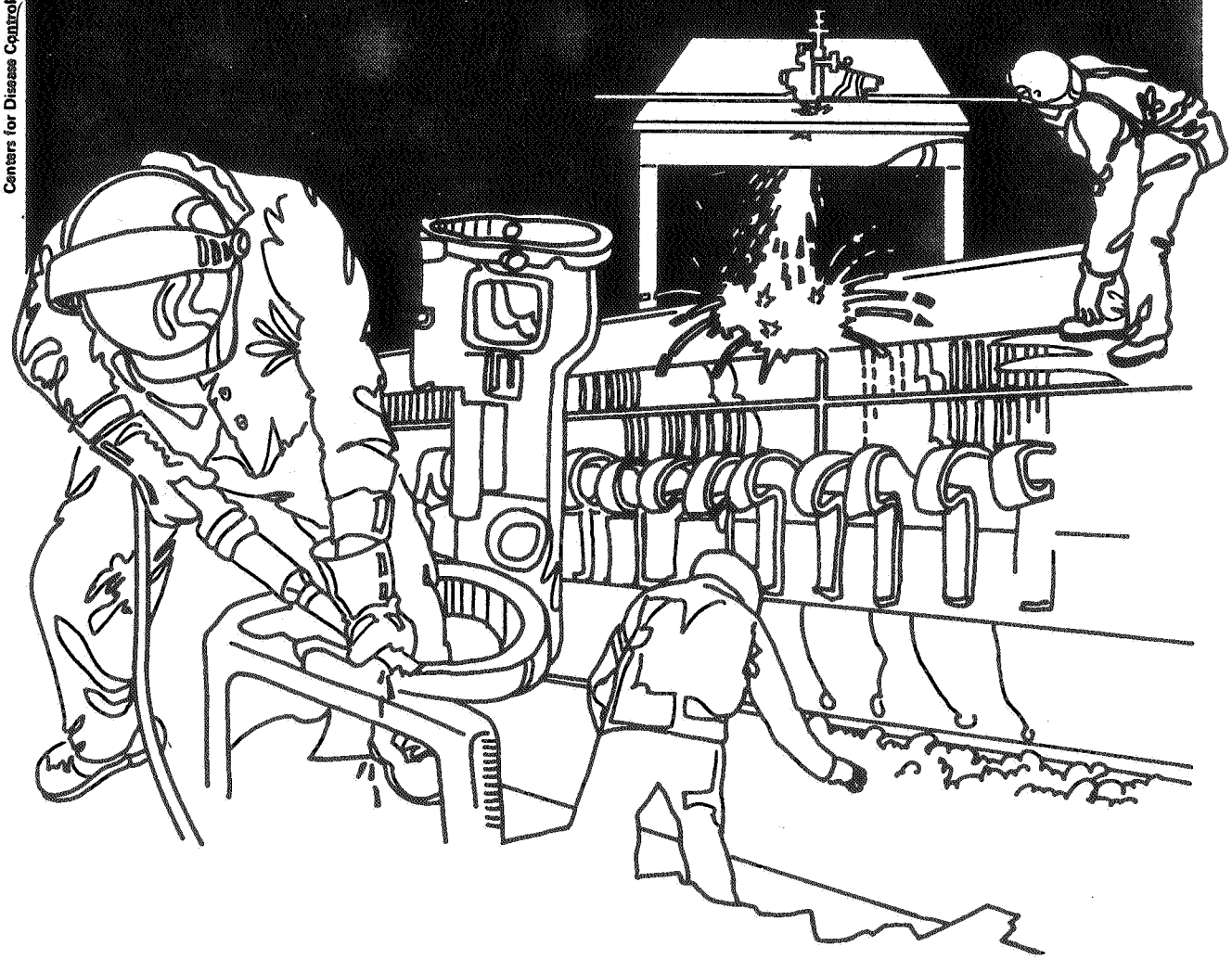

Health Hazard Evaluation Report

HETA 82-210-1418
LEGAL SERVICES PLAN - DC 37
NEW YORK, NEW YORK

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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LEGAL SERVICES PLAN - DC 37
NEW YORK, NEW YORK

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I. SUMMARY

In April 1982, the National Institute for Occupational Safety and Health (NIOSH), and the New York City Department of health received a request to investigate possible causes of eye irritation, headaches, rashes, increased fatigue and menstrual irregularities among personnel working in the 10th floor offices of District Council 37 (DC 37) at 140 Park Place, New York City.

The management of the union had hired consulting firms to test and balance the ventilation system and to perform an industrial hygiene survey of the 10th floor office area. The ventilation system was balanced to 96% of the design specifications and no excessive exposure to hazardous contaminants was determined.

Over the next several months, representatives of NIOSH and of the New York City Department of Health met with employees and management of the facility to discuss the situation and possible causes of the symptoms. Environmental measurements for formaldehyde were made on the 10th floor. Concentrations of organic solvents were determined in a similar office suite on the 3rd floor which had just installed carpeting and area dividers made by the same manufacturers as those used in the 10th floor offices. No formaldehyde or excessive exposure to organic vapors were found. Small concentrations of perchloroethylene, trichloroethylene and methyl chloroform were determined to be present in the atmosphere of the 3rd floor office, indicating that possible similar out-gassing from the new furnishings on the 10th floor had occurred.

An extensive health questionnaire was administered to the 10th floor employees and to a control group. A high proportion of all workers reported uncomfortable environmental conditions at work and health symptoms. For the most part, complaint rates did not differ significantly between those on the 10th (exposed) floor and those on the other (unexposed) floors in regard to comfortable working conditions, irritative and low level central nervous symptoms, and job satisfaction. However, the 10th floor had a significantly higher percentage of workers who reported worse health in the past year and menstrual problems than did workers on the control floors.

Based on the results of this evaluation, NIOSH concludes that no overexposure to hazardous chemicals existed at the time of the surveys. Possible out-gassing of organic solvents from the new furnishings may have occurred on the 10th floor causing concern about the air quality in the office, discomfort and increased dissatisfaction with the new surroundings among the employees. Recommendations to help prevent further problems are included in section VII of this report.

KEYWORDS: SIC 8111 (Legal Aid Services), closed building syndrome, eye irritation, headache, fatigue, methyl chloroform, trichloroethylene, toluene, perchloroethylene, xylene, alkanes.

II. INTRODUCTION

In April 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from both the management and employees of District Council 37 (DC 37), American Federation of State, County and Municipal Employees, AFL-CIO. DC 37 is a union that represents about 110,000 municipal employees of New York City. However, in this case, DC 37 is the "management", and the "unions" are Local 153 of the Office of Professional Employees International Union, which represents the clerical staff and the Municipal Employees Legal Services Staff Association (MELS), Federation of Field Representatives, which represents the professional employees, who are mostly lawyers. The hazard evaluation was prompted by concerns about the office environment causing medical symptoms of eye irritation, fatigue, dermatitis and/or menstrual disorders among the employees who are quartered in the 10th floor offices at DC 37, 140 Park Place, New York, N.Y. 10007. The New York City Department of Health (NYC) received a similar request for services and it was decided to collaborate on a joint investigation of the work site, with NIOSH concentrating on the environmental study and NYC concentrating on the epidemiological study.

III. BACKGROUND

The building at 140 Park Place is about 60 years old and formerly housed a newspaper. About 20 years ago, DC 37 began moving into the building and today occupies 8 floors of the 12 story structure. The 6th and 7th floors house offices of a telephone company. The two floor penthouse is private.

In July 1981, the Municipal Employees Legal Services Plan (MELS) occupied the 10th floor and a small portion of the 9th floor. This office provides legal consultation to the members of the union. Most of the 125 MELS employees had been housed previously in traditional, individually walled offices in a building a few blocks away from 140 Park Place. Many employees voiced strong dissatisfaction with the move, citing the relative lack of privacy for interviewing their clients in the new facility.

Within a few weeks of occupying the new facility, many of the employees began to express concern about eye irritation, malaise, dermatitis and menstrual disfunction. These complaints were coupled with the general feeling that "something was in the air."

The 10th floor area is about 15,100 square feet, with a 10 foot high ceiling. The new office design is that of an "open office". Individual work areas (about 6'x 8') are separated by 6 foot high dividers. There are 56 work areas in 14 rows, with 4 areas per row. One or two secretaries are stationed at the East end of each row (a total of 21 positions). Other clerical positions are scattered on the floor, mostly

on the northern side of the floor. Nineteen private offices are located on the North or West perimeters of the building. The South perimeter of the building contains three conference rooms. The East perimeter of the building contains the elevator banks and the public areas of each floor. Eleven interview rooms are located between the secretaries' area and the elevator banks.

The steam heat registers of the floor are located around the North, East and West perimeters of the building. The windows may be opened. The air handling system for the 10th floor is uncomplicated. There are two fan rooms on the 10th floor, on the northeast and southwest corners of the building. The amount of fresh air entering the system is controlled by dampers. The mixing of fresh air is done within the fan rooms. There are no provisions for humidification, dehumidification or pre-heating of the air. A consequence of this type of system is that the individuals with offices on the perimeter complain about too much heat and the individuals with work areas in the center complain about too little heat in the Winter. The situation was exacerbated during the Winter of 1981/82 when the amount of cold, fresh air supplied to the 10th floor was increased as a result of the complaints about air quality and eye irritation, etc.

No "chemicals" are used in the office. Typical office equipment is used, i.e.; typewriters and a few duplicating machines. The floor is equipped with direct, overhead lighting, which provides for bright work surfaces but makes the office appear dark and gloomy.

Because of the employees' complaints about the air quality, the office management attempted to determine if there was a physical basis for the complaints. In the Summer of 1981, the ventilation system of the 10th floor was evaluated and balanced by an outside ventilation consulting firm. The design criteria of the 10th floor's ventilation system calls for 31,275 cubic feet of air per minute (cfm) to be circulated. The evaluation determined that 30,064 cfm was circulated, well within the limits of precision. Individual ventilation grills and ventilation areas were also within the limits of precision. Later that year, an industrial hygiene consultation firm surveyed the 10th floor office, using detector tubes and charcoal sampling tubes as the collection medium but were unable to determine any measurable exposures to any organic contaminant or to formaldehyde.

IV. EVALUATION DESIGN AND METHODS

NIOSH has had much experience in the investigation of building related illness episodes. The general procedure is to perform an initial visit of the facility to interview the employees briefly to determine their impressions of the office and symptoms, to obtain general characteristics of the air handling system, heating system, types of office equipment and furniture, fumigation procedures, to determine if any changes had been introduced into the office and to determine if the office management had taken any steps to determine possible causes of the employees' concerns.

After obtaining this background information, NIOSH then determines what procedures are necessary to further define the situation and evaluates the exposure, if any, to chemical contaminants.

A. ENVIRONMENTAL

At DC 37, the entire set of office furniture was new except for a few desks and chairs which were brought from the old office. The ventilation system was balanced and the atmosphere had been tested for the presence of the chemicals which are usually encountered (in small concentrations) in an office setting. After reviewing the industrial hygiene consultants' report, it was decided to perform a survey for the presence of airborne formaldehyde, as the sampling media (detector tubes) used by the consultant usually has a sensitivity which will not detect the small concentration of formaldehyde which has been associated with eye and mucous membrane irritation in some individuals.

In testing for organics, the consulting firm employed sampling equipment, sampling times and analytical methods similar to those used by NIOSH. It was felt that no purpose would be served by duplicating the consulting firm's efforts, especially since the consulting firm performed its survey when the office was "newer", and the concentrations of any organic chemicals out-gassed from the new office furniture would have been greater than may exist months later.

Often NIOSH is called into an office months or years after the introduction of new equipment or furnishings. If a contaminant(s) had been out-gassed when the furnishings were new, the airborne concentration may have been greatly reduced by the time of NIOSH's involvement. In the late Spring of 1982, an unique sampling opportunity presented itself. A small office on the 3rd floor of the DC 37 building was refurbished using the same brands of area dividers, carpeting and glue as had been installed in the 10th floor offices. It was decided to sample the 3rd floor office for organic contaminants. The sampling method was similar to that used by the consultants: samples were collected on activated charcoal and analyzed using a standardized gas chromatography-mass spectrometry method.

B. MEDICAL

In June 1982, NYC distributed a self-administered questionnaire (Appendix A) which was completed by the DC 37 workers who were present on the days of the investigation. Sections of the questionnaire had been pretested through use in previous NIOSH investigations. The workers included:

104 exposed workers: MELS members on the 10th and 9th floors plus workers from the small unit on the 3rd floor Public Service Unit (PSU) which had undergone renovations similar to those which had been done on the 10th floor.

117 unexposed workers: personnel from different divisions, located on the 3rd and 8th floors, which had not been remodeled.

The few workers from the 3rd floor PSU unit and the 9th floor MELS unit (nine and seventeen employees, respectively) were not included in the final statistical analysis because it was felt that they might differ in various ways from the known exposed employees on floor 10. Because our statistical methods work best with larger numbers, the unexposed workers from floors 3 and 8 were combined to provide one large group of unexposed controls (designated group 11). The final categories used for analysis were:

Group 10--75 exposed workers from the 10th floor, and
Group 11--117 unexposed workers from the 3rd and 8th floors.

Some characteristics of the participants are listed in Table 1

V. EVALUATION CRITERIA

A. Environmental Criteria

1. Air Contaminants

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH employs environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, pre-existing medical conditions, and/or hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the workers to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and thus potentially increase the effects of overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. The OSHA standards are required to take into account the feasibility of controlling exposures; the NIOSH-recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. It should be noted that industry is legally required to meet only those levels specified by OSHA standards.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8-to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposure.

2. Building Related Illness Episodes

Building-related illness episodes have been reported more frequently in recent years. These episodes usually involve offices where there is no substantial exposure to any chemicals. Symptoms often reported are eye, nose and throat irritation, headache, fatigue and sinus congestion. Occasionally, upper respiratory irritation and skin rashes are reported.In some cases, the cause of the symptoms has been ascribed to an airborne contaminant, such as formaldehyde, tobacco smoke, or insulation particles, but most commonly a single cause cannot be pinpointed.

Imbalance or malfunction of the air conditioning system is commonly identified, and in the absence of other theories of causation, illnesses are usually attributed to inadequate ventilation, heating/cooling or humidification.

The contaminants which were suspected of being present on the 10th floor were formaldehyde and organic vapors.

Formaldehyde: formaldehyde and other aldehydes may be released from foam plastics, carbonless paper, particle board, plywood and textile fabrics. Formaldehyde is an irritant to the eyes, nose, mouth and throat.

Organic vapors: organic vapors are released from dispersants and toners used in photocopying machines, telecopiers, fresh paint, glue and many cleaning compounds. Traces may be out-gassed by "new" or recently cleaned fabrics. Organic vapors can be irritants to the mucous membranes, and at high concentrations, are central nervous system depressants.

3. Ventilation Evaluation Criteria

Neither NIOSH nor OSHA has developed ventilation criteria for general offices. Criteria often used by design engineers are the guidelines published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE)[1]. Their new standard (ASHRAE 62-1981, "Ventilation for Acceptable Indoor Air Quality") is based on an occupant density of 7 persons per 1,000 ft^2 of floor area. For general Offices where smoking is permitted, the rate recommended is 20 cfm per person of fresh "out-door" air. Due to energy restrictions, this ventilation rate often is not supplied in periods of very hot and cold temperatures.

B. Medical

Two approaches were used in the epidemiological investigation. One

involved looking at all workers who reported symptoms to see whether they differed by age, sex, race, job title, work station or floor from those without symptoms. The purpose of doing so was to discern whether patterns emerged to suggest if any of these factors play a role in causing or explaining symptoms. The second approach focused only on the 10th floor workers, as they initiated the complaint. Those on the 10th floor who were defined as cases were compared to those on the 10th floor defined as non-cases (or controls) to see whether or not they differed on these factors. Statistical methods were used to determine whether differences between the two groups (those with symptoms and those without) were "significant", that is, unlikely to occur by chance.

VI. Results and Discussion

Environmental

The ventilation system of the 10th floor is capable of supplying about 30,000 cfm. Assuming an average attendance of about 100 workers each day, the amount of "fresh" air recommended by the ASHRAE standard (2,000 cfm) could easily be supplied on all but the coldest and hottest days, when the dampers are closed.

No formaldehyde was determined to be present either on the 10th or 3rd floor offices (limit of detection = 0.01 parts per million parts of air: ppm). The OSHA Permissible Exposure Limit (PEL) is 3 ppm[2].

Table 2 lists the concentrations of organic vapors which were determined to be present in the 3rd floor office suite where new area dividers, etc., had been installed about 2 weeks before the time of the environmental surveys. The samples listed in Group 1 were taken while the ventilation system was in normal operation. The samples listed in Group 2 were taken while the ventilation system was not in operation and after the system had been shut off for two days during the week-end. Only room 2 is a true room with walls to the ceiling. The other "rooms" have 6' high partitions instead of floor to ceiling walls. The airborne concentrations in both groups of samples are well below the NIOSH recommendations and the OSHA standards[3] listed at the bottom of the table. The concentrations listed are quite near to the limit of detection of the sampling/analytical method used. Exposure to higher levels of these six contaminants may produce symptoms such as eye and mucous membrane irritation, headache and nausea. Exposure to such low levels of these contaminants, singularly or in combination, would not be expected to produce any symptoms. The concentrations in Group B, which were collected after the ventilation system had been shut down for the week-end are a little higher than those of Group A, which were measured while the ventilation system was in operation. Subjectively, the office was much stuffier and the odor from the area dividers was more pronounced while the ventilation system was not in operation. Many of the employees in the 3rd floor office objected to the air quality while Group B samples were being collected. It should be

mentioned that many compounds have odor thresholds at levels far less than those that can be measured environmentally and also less than those that are known to produce toxic effects.

Three of the compounds measured (alkanes, toluene and xylene) often are found in offices in the concentrations measured. Even though the concentrations measured were very low, it is unusual to detect any measurable concentrations of 1,1,1-trichloroethane (also known as methyl chloroform), trichloroethylene and perchloroethylene in an office setting. All six compounds are common industrial solvents. The presence of these three compounds probably is an indication of the newness of the area dividers.

Medical

A high proportion of all workers throughout the building (exposed and unexposed) reported uncomfortable environmental conditions at work and health symptoms (see Tables 3 and 4). Environmental complaint rates did not differ significantly between those on the 10th floor and those on the other (unexposed) floors. Two environmental complaints - too little air and stuffy air - were significantly associated with the employees' work stations. These conditions were reported significantly more often by those who work in cubicles and at open desks than by those working in private offices. Administrators/supervisors mostly are located in private offices with windows, which may account for the differences.

While there were no statistically significant differences in rates of environmental complaints between job titles, the trend was for clerical workers to report the highest rates of discomfort (dry, stuffy, stagnant air and odors) and for administrator/supervisors to report the fewest problems.

In both groups, more than 25% of respondents reported that their health had been worse in the past year. "Poor health" and "worse health in the past year" were each significantly correlated with the symptoms of headache, fatigue, and mucous membrane irritation (eye, nose or throat irritation, tearing or itching eyes). Forty-seven percent of menstruating female respondents reported menstrual irregularities in the past year.

Significant differences between the exposed (10th floor) and unexposed (3rd and 8th floors) were noted for the following variables:

- Fatigue
- Skin irritation
- Health worse this past year
- Menstrual irregularities this past year

Except for menstrual irregularities, which were reported most frequently by clerical workers, complaints were not attributable to sex, job title or job dissatisfaction.

A nested case control analysis was performed within the 10th floor. This is a procedure whereby persons defined as cases were compared to those defined as non-cases within th 10th floor. Cases (n=19) were defined as those women who reported menstrual problems within the past year (replied yes to 2 out of 3 of the following symptoms: increased flow, increased cramping or irregular periods). Controls (N=32) were defined as all other menstruating women working on the 10th floor. There were no significant differences in work conditions between these two groups.

Stepwise logistic regression, a procedure used to determine what variables contribute most to an outcome, indicated that work on the 10th floor and a "clerical" job category were significant predictors of menstrual problems.

VII. CONCLUSIONS

More than half of all workers reported uncomfortable environmental conditions (especially cold, stuffy air, too little air movement). More than one quarter of workers also complained of fatigue, irritative health symptoms and worse health in the past year. A high proportion of female respondents described menstrual irregularities in the past year.

These complaints were not associated with job dissatisfaction. A high percentage of workers (50%) say they work hard and at a fast pace, they also report that they control the pace of work and that they receive respect for their work. This is noteworthy because one model invoked to explain outbreaks of "tight building syndrome" hypothesizes that worker dissatisfaction forms the back-drop for such events. The survey results do not provide supporting evidence for this theory in this case.

The reluctance of many individuals in relocating to the 10th floor offices and their concern about lack of facilities to interview their clients in private may be reflected in the predominance of reports of "no privacy when speaking", "no visual privacy" and "too much traffic" among the responses to questions about adverse working conditions.

Uncomfortable working conditions, irritative and low level central nervous system symptoms and job satisfaction were fairly evenly reported from all floors. The 10th floor had a significantly higher percentage of workers who reported worse health in the past year, fatigue, skin irritation and more menstrual problems than the control floors.

More research is needed before we adequately understand the issue of menstrual irregularities. While there have been other anecdotal reports of menstrual irregularities among groups of workers, to date there is no known association with low level exposure to organic solvents, formaldehyde or the other environmental contaminants of concern here.

NIOSH determined no exposure to excessive concentrations of contaminants in the DC 37 offices. The findings of our survey indicate that the new

area dividers and/or other new furnishings did generate small concentrations of organic solvents. The perception of the odors of the new area dividers and the general discontent about the new surroundings by the employees may have acted to increase the negative general feelings of the staff to their new surroundings.

VII. RECOMMENDATIONS

It is noteworthy that while irritative and central nervous system symptoms were reported by workers throughout this building, certain complaints were highest among those working on newly renovated floors with new rugs and room dividers. If further renovation is planned, workers should be removed from the affected units during the reconstruction period and should not return until sufficient time has elapsed for airing out. The Environmental Epidemiology Unit of the New York City Department of Health will offer an educational session on tight building syndrome for the DC 37 employees who work at 140 Park Place upon request.

IX. REFERENCES

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. ASHRAE standard 62-1981, ventilation for acceptable indoor air quality. Atlanta, Georgia: ASHRAE, 1981.

2. Occupational Safety and Health Administration. OSHA safety and health standards. 29 CFR 1910.1000. Occupational Safety and Health Administration, revised 1980.

3. National Institute for Occupational Safety and Health. NIOSH/OSHA occupational health guidelines for chemical hazards. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1981. (DHHS (NIOSH) publication no. 81-123).

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

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For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Copies of this report have been sent to:

1. Municipal Employees Legal Services Staff Association, Federation of Field Representatives
2. Office of Professional Employees International Union, Local 153
3. District Council 37, American Federation of State, County and Municipal Employees, AFL-CIO
4. NIOSH, Region II
5. OSHA, Region II
6. New York State Department of Health
7. New York City Department of Health

DC 37

Table 1

Characteristics of Respondents

Distribution by floor	Number		Percentage	
3rd Floor (Group 11)	68		35	
8nd Floor (Group 11)	49		26	
Subtotal		117		61
10th Floor (Group 10)	75		39	
Totals		192		100
Distribution by sex				
Male	49		26	
Female	143		74	
Totals	192		100	
Distribution by job title				
Administration/Supervisor	32		16.7	
Professional	30		15.8	
Clerical	59		30.8	
Other	71		36.7	
Totals	192		100.0	
Distribution by work station				
Private office	27		14	
Cubicle	69		36	
Open desk	96		50	
	192		100	

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Table 2
Airborne Hydrocarbon Levels
(milligrams per cubic meter of air)

Location	Alkanes(a)	1,1,1-TCE(b)	TCE(c)	Tol(d)	PCE(e)	Xyl(f)
Group 1 (normal ventilation)						
Room 2	.15	---	---	.02	---	.01
Room 5	.15	.04	---	.01	---	.02
Room 11	.29	---	---	.01	---	.01
Room 14	.55	.02	.02	.01	---	.03
Room 16	.18	.02	---	.01	---	.01
Room 23	.19	.04	.02	.02	---	.01
Group 2 (restricted ventilation)						
Room 2	---	---	.02	.02	.004	.03
Room 5	.11	.10	.04	.02	.01	.05
Room 11	.10	.03	.05	.02	---	.05
Room 14	.10	.04	.05	.01	.004	.04
Room 17	.06	.03	.06	.01	---	.03
Room 23	.10	.04	.07	.02	---	.04

Chemical	OSHA PEL	NIOSH Recommendation
(a) Alkanes C_{10-12}	(1)	(1)
(b) 1,1,1-trichloroethane	1,900	1,900 (ceiling)
(c) Trichloroethylene	535	400[2]
(d) Toluene	750	375
(e) Perchloroethylene	680	340[2]
(f) Xylene	435	435

(1) Neither OSHA nor NIOSH has a standard for exposure to C_{10-12} Alkanes.

(2) These compounds are suspect carcinogens. Exposure should be reduced to the lowest feasible concentrations.

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Table 3

Uncomfortable Work Conditions Reported by 50% of Respondents

Complaint	Percentage Reporting Problem
No privacy when speaking	79
No visual privacy	69
Too much traffic	67
Too little air movement	65
Stuffy air	60
Too cold	58
No access to windows	58
Too crowded	56
Too noisy	52

DC 37

Table 4

Health Symptoms Reported by 25% of Respondents

Symptom	Percentage Reporting Problem
Menstrual irregularities	47 (of menstruating females)
Fatigue	34
Worse health past year	28
Eye irritation	27
Nose/throat irritation	25
Headache	25
Poor health	25