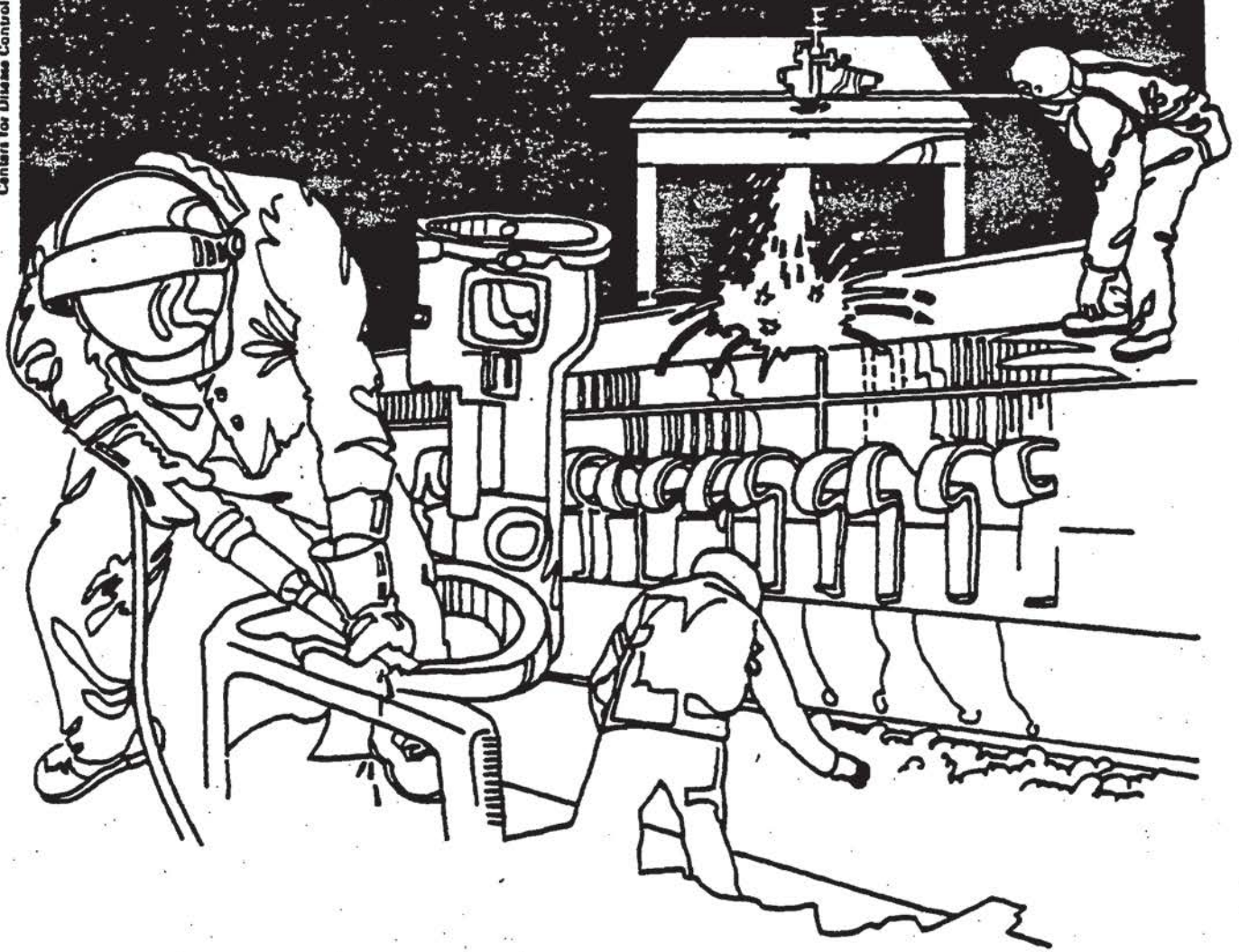


NIOSH



Health Hazard Evaluation Report

HETA 85-062-1652
VETERANS ADMINISTRATION CENTER
AND REGIONAL OFFICE
PHILADELPHIA, PENNSYLVANIA

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.

HETA 85-062-1652
JANUARY 1986
VETERANS ADMINISTRATION CENTER
AND REGIONAL OFFICE
PHILADELPHIA, PENNSYLVANIA

NIOSH INVESTIGATORS:
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I. SUMMARY

On November 9, 1984, the National Institute for Occupational Safety and Health (NIOSH) was requested to evaluate a health hazard among office workers at the Veterans Administration Center and Regional Office in Philadelphia, Pennsylvania.

In January, 1985, a NIOSH physician and an industrial hygienist conducted an initial visit to the facility. Interviews with union representatives and other employees revealed no acute health complaints; however, employees feared that asbestos exposure might be causing relatively high rates of cancer deaths. They were also concerned that ventilation might be inadequate.

Medical and personnel records were incomplete, but twenty names, social security numbers, and possible years of death were obtained for presumed cancer cases, so that we could attempt to obtain death certificates. Death certificates were provided by the state of Pennsylvania for ten of the twenty names listed. This number was too small for us to draw any conclusions about the existence of a cancer cluster.

Bulk samples from the steam pipes and damaged ceiling tiles in the areas of concern were taken by the industrial hygienist. In May, 1985, twelve area air samples were collected and analyzed for asbestos fibers. Temperature, relative humidity, and carbon dioxide levels were also measured.

Three of the five bulk samples showed chrysotile asbestos to be present. The ceiling tile and the pipe covering contained 30-40 percent chrysotile asbestos. No asbestos was found in the dust settled on a file cabinet. The air fiber concentrations were all below the laboratory limit of detection (3000 fibers/m³). Asbestos is a known human carcinogen and there is no known level of exposure which can be considered risk-free. Therefore, NIOSH recommends that exposure to asbestos be kept below any reliably detectable level. Recently NIOSH has used 10,000 fibers/m³ ("fibers" here refers to fibers greater than 5 microns in length), in non-industrial settings, as a guideline for assessing contamination. This level can be reliably determined by phase contrast microscopy in office buildings.

The percent relative humidity (RH) ranged from 27 to 36 and the temperature from 71 to 79.5 degrees F on May 2, 1985; on May 3, 1985, the percent RH ranged from 34 to 42 and the temperature from 68-75 degrees F. Indoor air studies have shown that employees are placed in a "discomfort zone" if temperature exceeds 78 degrees F and if percent RH falls below 30 percent. The carbon dioxide levels range from 245 to 565 parts per millions of air. If carbon dioxide levels are below 600 ppm, an adequate amount of outside air is considered to be present.

Based on the information obtained during this survey, it has been determined that at the time of the survey a potential hazard from exposure to asbestos existed if pipes or ceiling tiles were damaged or disturbed. In addition, on one day temperature was high enough and relative humidity low enough to place employees in a "discomfort zone." Recommendations for reducing these hazards are contained in Section IX of this report.

KEYWORDS: SIC 9451 asbestos, office buildings, indoor air pollution, cancer, carbon dioxide, temperature, relative humidity.

II. INTRODUCTION

On November 9, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request from an employee representative for a health hazard evaluation at the Veterans Administration Center and Regional Office in Philadelphia, Pennsylvania. The request stated that there had been a very high rate of cancer deaths among employees and recent retirees which the employee representative felt could be associated with poor ventilation and asbestos exposure.

On January 23, 1985, a NIOSH physician and an industrial hygienist visited the Veterans Administration Center and Regional Office. An introductory meeting was held with representatives of the employees and management to explain the reason for our visit and to ascertain what the health problems were. Following this meeting, a tour of the areas where there were concerns was made. Bulk samples of the materials suspected of containing asbestos were collected.

The medical officer interviewed employees, and visited the personnel office and the medical department to obtain names and records of employees who may have died of cancer or who are being treated for cancer.

On May 2 and May 3, 1985, the industrial hygienist returned and took twelve air samples for asbestos fibers and measured temperature, relative humidity, and carbon dioxide levels. Five bulk samples for asbestos were taken from steam pipes and ceiling tiles from both office areas where employees regularly worked and storage areas where maintenance people occasionally worked.

III. BACKGROUND

The Veterans Administration Center and Regional Office occupies 22,500 square feet of a three-story building. The Treasury Department occupies the remainder of the building. This building was built in 1928 and was formerly occupied by an electronics firm. All the steam pipes are covered with asbestos. Most of the ceiling tiles are of asbestos composition. GSA is in the process of removing all the asbestos from the building.

IV. ENVIRONMENTAL EVALUATION METHODS

A. Asbestos

On May 2 and 3, 1985, area air samples were collected for asbestos fibers on 0.8 micrometers (um) mixed cellulose, 37 millimeter (mm) diameter membrane filters in three-piece open-face filter holders, and 25 mm diameter three-piece cassettes with a 50 mm extension cowl with cellulose ester filter, 0.8 pore size. Air sampling was done with a personal sampling pump operating at 2 liters per minute for approximately 9 hours and with a high volume pump with a limiting orifice for approximately 2 hours. Air volumes ranged from 1010-1963 liters.

Bulk samples were collected from steam pipes and ceiling tiles in five areas, including both office areas and storage areas. The samples were analyzed for percent and type of asbestos.

All samples were examined for homogeneity. Non-homogeneous samples were ground manually to insure homogeneity. Microscope slides were prepared from each sample using 1.55 refractive index liquid. The slides were then examined for the presence of asbestos utilizing polarized light microscopy and dispersion staining techniques. A Leitz Dialux 2-microscope equipped with a 16X objective and a 120X eyepiece was used for the analysis. The percentage of asbestos was estimated microscopically by a visual examination of the fibers with an aspect ratio of 3:1 or greater. If present, asbestos identities were confirmed with the appropriate refractive index liquids applying dispersion staining techniques. The samples were examined by two separate analysts and the results averaged.

B. Relative Humidity

Dry and wet bulb temperature measures were made on May 2 and 3, 1985 with a Bendix psychrometer. Measurements were made both in the A.M. and P.M.

C. Carbon Dioxide

Two carbon dioxide determinations each day were made on May 2 and 3, 1985 with long term length of stain detector tubes.

V. MEDICAL EVALUATION METHODS

Unstructured interviews were conducted with twenty employees including the union steward. Employees were asked about any health complaints which could be related to work, and any concerns they had about working conditions. They were also asked to identify other employees or former employees who might have been diagnosed as having cancer any time in the past fifteen years.

In order to investigate the possibility of an abnormally high rate of cancer deaths among employees and retirees at the Veterans Administration Center, the medical officer visited both the personnel department and the medical department. Unfortunately, records are not kept on retirees after a year or two; neither is there necessarily any record of a diagnosis of cancer in an employee's file even if this file is still available. The medical officer obtained a partial list of presumed cancer deaths in the past ten years from interviews with union officials, other employees, personnel administrators, and the occupational health nurse.

Presumed date (or year) of death was gathered from the preceding sources for each name on the list; Social security numbers (SSN) and birthdates were obtained from personnel files when available. Smoking histories and work histories were gathered as far as possible from the medical files and from interviews with other employees or, in two cases, with next-of-kin. Information on twenty people was obtained in this way; these names, along with SSN and birthdates for each, were sent to the state of Pennsylvania with a request for death certificates. Because death certificates list cause of death and "other significant conditions", it was hoped that there would be sufficient information available for us to be able to note any unusual clustering of certain types of cancers. Both the union and the occupational health nurse hoped to be able to locate additional names so that more death certificates could be requested, but no additional names were located.

VI. ENVIRONMENTAL CRITERIA

As a guide to the evaluation of the hazard posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. This criteria is 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 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 a 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 worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criteria. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposures.

Evaluation criteria may change over the years as new information on the toxic effects of an agent becomes 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 Standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet those levels specified by an OSHA standard.

A time-weighted average (TWA) exposures 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 exposures.

Asbestos

The Occupational Safety and Health Administration (OSHA)⁽¹⁾ standard for asbestos is 2.0 fibers greater than 5 microns in length per cubic centimeter (f/cc). NIOSH recommends that exposure to asbestos be kept below any reliably detectable levels (10,000 fibers/cubic meter [f/m³] for non-industrial settings and 100,000 f/m³ for industrial settings using phase contrast microscopy). OSHA proposed an Emergency Temporary Standard of 0.5 f/cc, but court action has prevented its taking effect.

Ventilation and CO₂

Neither NIOSH nor the Occupational Safety and Health Administration (OSHA) have developed ventilation criteria for general offices. Criteria often used by design engineers are the guidelines published by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). ASHRAE Standard 62-1981⁽²⁾ provides ventilation requirement guidelines for a wide variety of commercial, institutional, and industrial facilities, including office buildings. This standard is based on an occupant density of seven persons per 1000 ft² of floor area, and recommends higher ventilation rates for areas where smoking is permitted. The standard states that indoor air quality for general offices shall be considered acceptable if the supply of outdoor air is sufficient to reduce CO₂ to less than 2500 ppm and control contaminants, such as various gases, vapors, microorganisms, smoke, and other particulate matter, so that concentrations known to impair health or cause discomfort to occupants are not exceeded. However, the threshold levels for health effects from these exposures are poorly documented. For general offices where smoking is not permitted, the rate recommended under the standard is 5 cubic feet per minute (CFM) of outdoor air per person. Higher ventilation rates are recommended for spaces where smoking is permitted because tobacco smoke is one of the most difficult contaminants to control at the source. When smoking is allowed, the amount of outdoor air provided should at a minimum, be 20 CFM per person. Non-smoking areas may be supplied at the lower rate (5 CFM/person), provided the air is not recirculated from, or otherwise enters from, the smoking areas.

Several studies have suggested that in occupied spaces a level of CO₂ in excess of 1000 ppm is an indicator of inadequate outdoor supply in HVAC system. Occupant discomfort results from build-up of numerous contaminants, including cigarette smoke, hydrocarbons from copiers, etc., in the recirculated air within a building. The following evaluation criteria with regard to CO₂ in offices has been suggested by a Canadian investigator ⁽³⁾:

CO ₂ Level (ppm)	Comments
less than 600	Adequate outside air
600-800	Occasional complaints, particularly if the air temperature rises.
800-1000	Complaints are more prevalent.
greater than 1000	inadequate outdoor air in HVAC system; complaints are general.

Relative Humidity

Relative humidity⁽⁴⁾ has been shown to have a significant effect on the control of airborne infection. At 50 percent RH, the mortality rate of certain organisms is the highest and the influenza virus loses much of its virulence. The mortality rate of microorganisms decreases both above and below this value.

Low relative humidity is undesirable for reasons other than those based on human comfort. Low levels will increase evaporation from the membranes of the nose and throat and drying of the skin and hair. Some medical opinion attributes the increased incidence of respiratory complaints to the drying out of mucous membranes due to low indoor humidities in winter.

Studies of indoor areas show that high temperatures (greater than 78°F) and low humidity (less than 30 percent) place employees in a "discomfort zone".

VII. ENVIRONMENTAL RESULTS AND DISCUSSION

A. Asbestos

Three of the five bulk samples showed chrysotile asbestos to be present. The ceiling tile and the pipe covering were composed of 30-40 percent chrysotile asbestos. No asbestos was found in the dust settled on filing cabinets. (See Table II).

Twelve area air samples were collected for asbestos fibers. These samples were analyzed for asbestos fibers according to NIOSH Method P&CAM 7400⁽⁵⁾ Set A utilizing Phase Contrast Microscopy. The air fiber concentrations were all less than laboratory limit of detection (3000 f/m³). (Table I).

B. Temperature/relative humidity

On May 2, 1985, the percent relative humidity (percent RH) ranged from 27 to 36 and the temperature from 71 to 79.5°F. As was previously discussed, temperatures greater than 78°F and low humidity less than 30% will place the employees in a discomfort zone.

C. Carbon Dioxide

The carbon dioxide levels ranged from 245 to 565 parts per million parts of air. (Table IV) These determinations were made to determine if sufficient amount of outside air was being introduced. From these findings it appears that an adequate amount of outside air is being introduced.

VIII. MEDICAL RESULTS AND DISCUSSION

Interviews with twenty employees including the union steward revealed no acute health complaints. Employees were concerned about a possibly abnormally high rate of cancer deaths, and wished to know whether such a high rate of deaths existed and, if so, whether it could be associated with the asbestos known to be present in the ceiling tiles and on steam pipes in their work areas. Employees were also concerned about the adequacy of office ventilation.

The state of Pennsylvania returned death certificates on ten of the twenty names listed (five women and five men). Three people, one man and two women, died of lung cancer, two women of colon cancer, one man of gastric (stomach) cancer, one man of cancer of the small intestine, one man of cancer of the pancreas, and one woman of breast cancer.

Unfortunately, these numbers are too small to allow us to draw any conclusions. The list was only a partial list to begin with, and only 50 percent of the death certificates were obtained for people on this partial list. Though both lung and digestive cancers are certainly associated with exposure to asbestos, they are also among the most common cancers in the United States.

IX. RECOMMENDATIONS

While our measurements showed no detectable airborne asbestos, it should be noted that some asbestos abatement experts believe that removal of asbestos containing material is the only final and satisfactory solution to the problem of potential asbestos exposure.

As time passes, it would be expected that some deterioration would occur in the integrity of the pipe covering and the encapsulation. Such deterioration could possibly result in hazardous exposures to the personnel occupying these areas. Pipe covering may also be disturbed by maintenance work and by other damage such as water damage. Based on these findings and consideration, the following recommendations are made:

1. The pipe covering should be treated so that any loose fibers do not enter the work area.
2. A periodic program of inspection should be established to assure that the encapsulation has not deteriorated. Any deterioration should be promptly treated.

3. Maintenance personnel should be advised of the hazards of asbestos and supplied the proper disposable clothing and NIOSH approved respirators for asbestos, and given training in proper precautions. The area should be enclosed and labeled if asbestos-covered pipes or asbestos-containing ceiling tiles are to be disturbed, and other employees should not be present. If any dust is generated, the area should be cleaned with high efficiency particulate air (HEPA) filter vacuums, wet methods and proper waste disposal. EPA approved packaging and disposal practices should be instituted. These areas should be monitored prior to occupancy.
4. Should the asbestos monitoring programs show that the asbestos fibers are reaching the normal work areas then it will become necessary to promptly remove, isolate, or encapsulate the asbestos containing pipe covering.
5. Temperature should be maintained below 78°F and relative humidity so that it is equal to or above 30 percent.

X. References

1. OSHA Safety and Health Standards 29CFR 1910. 1000, Table Z-2, Occupational Safety and Health Administration, Revised 1983.
2. American Society of Heating, Refrigeration and Air-Conditioning Engineers: Standard 62-1981: VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY. Atlanta, GA (1981).
3. Rajhans, G.S.: Indoor Air Quality and CO₂ Levels. Occupational Health in Ontario. 4:160-167 (1983).
4. Ziskin, Morton M., M.D., DIBA, Occupational Pulmonary Disease, Vol. 30, #4, 1978.
5. National Institute for Occupational Safety and Health. NIOSH: Manual of Analytical Methods, Third Edition, Vol. 1, Cincinnati, OH U.S. Dept. HHS (NIOSH) Publications #84 100.

XI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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XII. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Veterans Administration Center and Regional Office
Philadelphia, Pennsylvania
2. President, American Federation of Government Employees
3. NIOSH, Region III
4. OSHA, Region III

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.

Table I
Veterans Administration Center and Regional Office
Philadelphia, Pennsylvania
HETA 85-062

Air Sample Results for Asbestos
May 2 and 3, 1985

<u>Sample Location</u>	<u>Air Volumes-Liters</u>	<u>Concentration-f/cc</u>
Lift Truck, Bldg.6	1550	N.D.**
1-P-2	1300	N.D.
Bldg. 6 Pamplet	1963	N.D.
1-F-10	1533	N.D.
1-K-2	1580	N.D.
1-G-4	1350	N.D.
1-O-10	1010	N.D.
1-E-7	1441	N.D.
1-G-4	1598	N.D.
1-N-3	1769	N.D.
Attorney's Office	1703	N.D.
DPC Sec.	1834	N.D.

* Denotes - Fibers greater than 5 microns in length per cubic centimeter.

** Denotes - None detected, limit is .003 fibers per cubic centimeters air volume adjusted.

Table II

Veterans Administration Center and Regional Office
Philadelphia, Pennsylvania
HETA 85-062

Bulk Sample Analysis for Asbestos

<u>Sample Site</u>	<u>Asbestos Content</u>
Ceiling Tile (Hard) Bridge, No. 6 Bldg.	30% Chrysotile 30-40%Chrysotile 1% Amosite
IGI Area	5% Chrysotile 1% Amosite
File Area (Settled Dust)	No Asbestos Detected

Table III
Veterans Administration Center and Regional Office
Philadelphia, Pennsylvania
HETA 85-062

May 2, 1985

Relative Humidity, Percent (%RH)

<u>Time</u>	<u>Dry</u>	<u>Wet</u>	<u>%RH</u>	<u>Location</u>
10:25	78.5	61.5	36	1-0-2
10:35	79.5	60	29	1-K-2
10:45	73.5	57	32	1-0-10
14:00	78	58	27	1-0-2
14:10	79	59	28	1-K-2
14:20	71	54	30	1-0-10
15:10	72	55	29	1-6-10

May 3, 1985

09:15	71.5	56.5	38	1-0-2
09:25	72	57	38	1-K-2
09:30	68	55	42	1-6-10
09:40	68	55	42	1-0-10
13:50	73	57	35	1-0-2
14:00	75	58	34	1-K-2
14:10	70	55	36	1-L-10
14:15	70	55	36	1-0-10
14:20	70	55	36	10-Q-11
14:25	70	56	40	1-L-12

Table IV

Veterans Administration Center and Regional Office
Philadelphia, Pennsylvania
HETA 85-062

Carbon Dioxide Air Concentration*

May 5, 1985

<u>Area</u>	<u>Time</u>	<u>Concentrations</u>
1-K-2	10:30-14:55	565
1-O-10	10:40-14:20	455

May 6, 1985

1-K-2	10:15-14:10	245
1-O-10	10:20-13:45	490

*Denotes - Parts per million parts of air sampled.

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