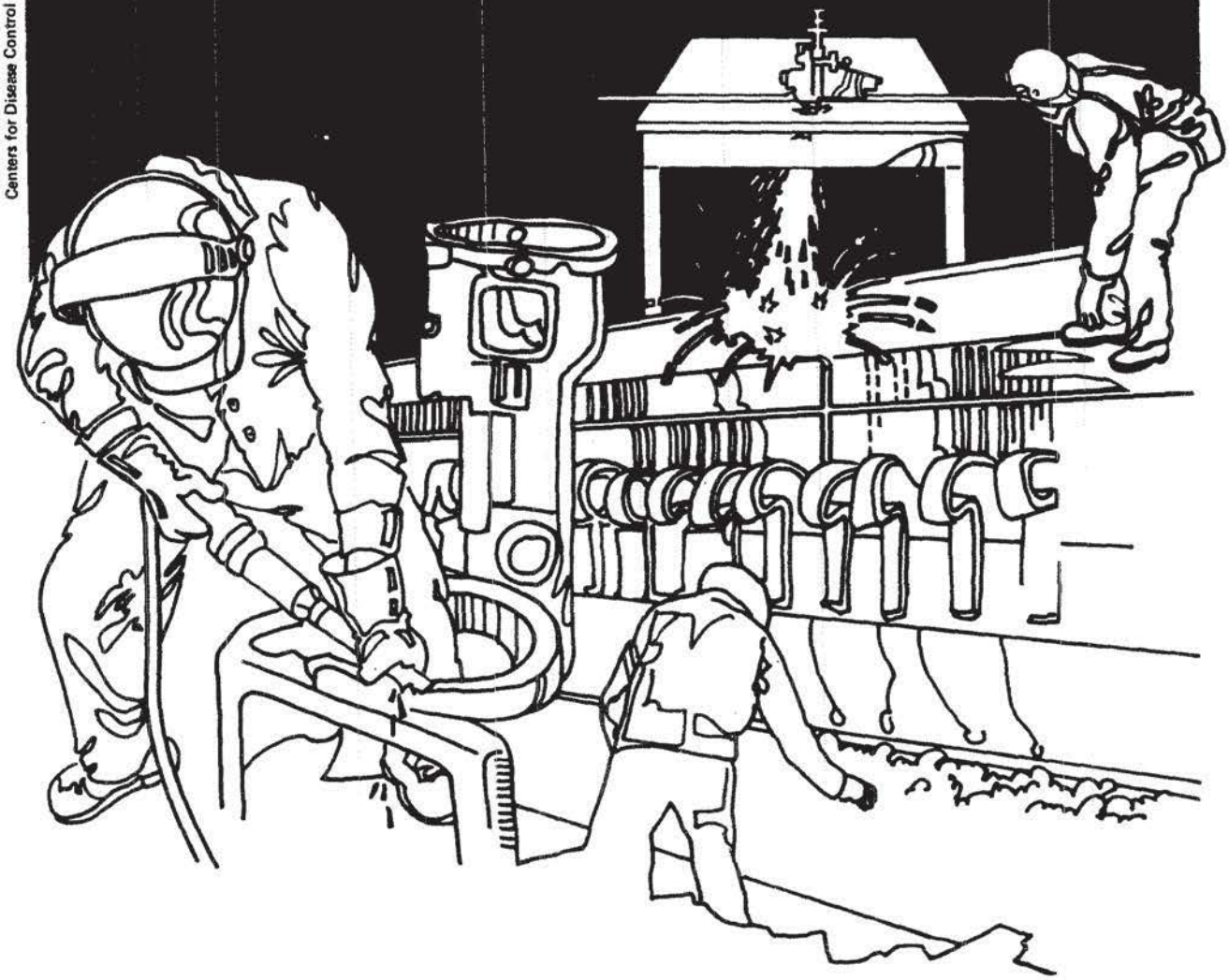
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

HETA 81-315-1227
PENNSYLVANIA STATE UNIVERSITY DUBOIS CAMPUS
DUBOIS, 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 81-315-1227
NOVEMBER 1982
PENNSYLVANIA STATE UNIVERSITY
DUBOIS CAMPUS
DUBOIS, PENNSYLVANIA

NIOSH INVESTIGATORS:
Walter J. Chrostek, I.H.
Richard A. Keenlyside, M.D.

I. SUMMARY

On May 18, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from Pennsylvania State University, State College, Pennsylvania for a health hazard evaluation at the DuBois campus. The request stated that persons working in the Student Learning Center building were suffering from eye and upper respiratory tract irritation, nose bleeds, skin rashes, fatique, headaches and nausea possibly caused by the building environment.

On July 7-8, 1981, NIOSH conducted an initial walk-through survey and obtained 14 air samples for formaldehyde and bulk samples of the insulation and air filter materials. Relative Humidity (RH) readings were also taken.

The airborne concentrations of formaldehyde ranged from 0.01 to 0.10 parts per million (ppm) of air sampled. These levels were lower than might be expected to cause significant irritant effects. Ten RH readings taken in various locations ranged from 60 to 74 percent (%). Outdoor RH was 58%. Formaldehyde was not detected in five samples of the insulation. One sample was analyzed for isocyanates and none was detected.

During a second visit on September 22, 1981, a NIOSH physician interviewed 12 of the approximately 25 employees present. At that time six atmospheric samples were collected to measure airborne dust levels and RH reading were taken. Nine employees had symptoms which included fatigue, headache, somnelence, eye and throat irritation, skin irritation or rash and loss of concentration towards the end of the working day. These were usually relieved after leaving work and at weekends. The occurrence of symptoms was unrelated to age, sex, type of work, length of employment or location in the building. Two employees stated that the symptoms had been greatly relieved following a temporary adjustment of the ventilation system two weeks previously.

In six area air smaples collected for total dust, the concentrations ranged from 0.01 to 0.09 milligram per cubic meter mg(m^3) of air. Trace amounts of fibrous glass were present. Eight RH readings obtained ranged from 36 to 48% (47% outdoors).

Formaldehyde measurements were made February 24, 1982, after the air conditioning system was balanced. Also a bulk sample of the plaster board was obtained for analysis of its formaldehyde content. Formaldehyde levels in both samples were less than .001 ppm per sample (the lower limit of detection).

Nine employees were interviewed; eight employees felt much better with fewer headaches, one employee felt fatigue in the afternoon.

On the basis of data obtained in this investigation, NIOSH determined that the symptoms reported by the employees could not be readily explained on the basis of exposure to dust or formaldehyde. The symptoms experienced are commonly reported by workers in buildings with recirculating air conditioning systems. Readjustment and balancing of the air handling system resulted in some relief of symptoms which support the hypothesis that poor air recirculation and inadequate ventilation may have contributed to the problem.

KEYWORDS:SIC 8221, (College), formaldehyde, isocyanates, fibrous glass containing dust, ventilation, eye and upper respiratory tract irritation, nose bleed, skin rashes, fatigue, headaches and nausea.

II Introduction

On May 18, 1981, a request was submitted by the industrial hygienist of the Pennsylvania State University, University Park Campus for investigation of eye and upper respiratory irritation, nose bleeds, skin rashes, fatigue, headaches and nausea among employees in the Student Learning Center of their DuBois campus.

II Background

The Student Learning Center is one of three buildings on the DuBois campus. It houses the administrative offices, an auditorium, an information center, bookstore, a Health Center, library and a student lounge. The Health Center consists of a waiting room, hallway, a center room and two treatment areas. The center room has no direct ventilation. The building is approximately seven years old and has sealed windows and a central heating and air conditioning system. Some of the employees occupying this building were formerly housed in an old mansion nearby where the windows could be opened. Health complaints were first reported shortly after the building was first occupied in 1975.

Since October 1980, the Pennsylvania State industrial hygienist has visited the DuBois campus periodically and has performed environmental air sampling. Prior to the first visit of the industrial hygienist, approximately 15-20% outside air was being introduced into the building in the summertime. The outside vents were closed in the wintertime to conserve energy and normal infiltration was 5-10% outside air. Since the environmental evaluation by the University industrial hygienist in 1980, 100% outside air had been introduced.

IV Methods

On the July 1981 visit, the NIOSH industrial hygienist conducted a walk-through survey, performed area air sampling for formaldehyde, collected bulk samples of the insulation and made relative humidity and ventilation determinations. Samples of the insulation materials and carpet were collected to be analyzed for fibrous glass, formaldehyde and toluene diisocyanate. No formaldehyde was detected in any of the samples by the NIOSH laboratory. Only trace amounts of fibrous glass was detected.

Sampling for formaldehyde was conducted out on July 7th in the morning and afternoon with the air conditioning system in operation. The system had been routinely shut off in the mid-afternoon and sampling was repeated during the following morning after no air circulation overnight. Academic sessions are conducted in the building during the evenings when the air conditioning system is not operating.

Fourteen air samples for formaldehyde were collected in impingers in series containing a 1% Sodium Hypochlorite solution, and pumps operating at 1 liter per minute. The samples were analyzed by NIOSH method P&CAM 125 (1). These were obtained in the library, Health Center, Rooms 108, 102, 191 and 106 and the bookstore.

Relative humidity measurements were made indoors and outdoors using a psychrometer. Ventilation readings were taken with an Alnor Velometer Jr. in Room 108, and the health center which were areas where employees had typical health complaints. Ten employees were interviewed during this visit and complaints documented.

A sample of foam used in underground insulation was collected at Pennsylvania State University, DuBois Campus and was submitted for determination of the presence of isocyanates. The analysis procedure chosen was infrared spectrophotometry (IR). Initially, a portion of the sample was dissolved in carbon disulfide. A film was cast from this solution and a spectrum taken of the film showed there is no evidence of the presence of an isocyanate functional group in this spectrum.

To determine the limit of detection by IR for this analysis, solutions of cyclohexyl-isocyante were prepared in carbon tetrachloride. A solution of the foam was also prepared. In the foam solution the presence of a compound containing an isocyante functional group at a concentration of 0.04% would have been detectable. Since a film sample as discussed in the previous paragraph had more than twice the sensitivity of a solution, an isocyanate concentration of 0.02% as cyclohexylisocyanate would have been detected.

On September 1981 visit, a NIOSH physician accompanied the industrial hygienist. Interviews were conducted with 12 of the approximately 25 employees who worked in the administrative offices, bookstore, library and medical center.

Six area air samples were collected for dust measurements during this visit. These were obtained in the administrative offices, library, Health Center and auditorium on tared 37 millimeter, 0.8 micron pore size polyvinyl chloride filter utilizing a sampling pump operating at approximately 1.75 liter per minute. The samples were analyzed and microscopically scanned for fibrous glass.

Following the completion of the balancing of the air conditioning system, repeat sampling was performed on February 24, 1982. Eight air samples and one bulk sample of paneling were collected at Pennsylvania State University, DuBois Campus and submitted for formaldehyde analysis. The air samples were collected on XAD resin coated with N-Benzylethanolamine. The air sampling was done at 50cc per minute. These samples were analyzed by NIOSH method P&CAM 345 (1).

Interim reports on the findings of these studies were sent to interested parties in September and October 1981. The latter included a recommendation that repeat sampling for formaldehyde should be performed after the air conditioning system had been balanced according to guidelines recommended to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

V Evaluation Criteria

Substance	OSHA	NIOSH
Formaldehyde*	3 TWA	LFL**
Dust Containing Fibrous Glass***	15	5

* Denotes parts per million parts of air sampled. (ppm)
** Denotes lowest feasible limit
*** Denotes milligrams of substance per cubic meter of air sampled. (mg/M^3)

A. Formaldehyde (3, 4, 5, 6)

Formaldehyde gas may have an irritant effect on the mucous membranes of the respiratory tract and eyes. Eye irritation is a common complaint and has been reported in industrial workers at airborne concentrations of 0.3-0.9 ppm. Controlled human exposures indicated that the group threshold for eye irritation was 1.2 ppm and for increased eye-blinking was 1.7 ppm. In exposed groups, an increase in eye irritation was observed ranging from no irritation at 0.03 ppm to some irritation at 3.2 ppm. The percentage of subjects exposed to formaldehyde levels of less than 0.1 ppm who may experience eye irritation is usually very low.

The aqueous solution splashed in the eyes may cause eye burns. Urticuria has been reported following inhalation of gas and repeated exposure may cause dermatitis from local irritation or allergy.

Systemic intoxication is unlikely to occur since intense irritation of upper respiratory passages compels workers to leave areas of exposure. Inhalation of high concentration of formaldehyde, may result in coughing, difficulty in breathing and pulmonary edema. Ingestion, although unusual, may cause severe irritation of the mouth, throat and stomach.

The National Institute for Occupational Safety and Health (NIOSH) recommends that formaldehyde be handled as a potential occupational carcinogen and that appropriate controls be used to reduce worker exposure (4). These recommendations followed the findings of the Chemical Industry Institute of Toxicology (CITT) study in which laboratory rats and mice exposed to formaldehyde vapor developed nasal cancer. Formaldehyde has also been shown to be a mutagen in several short-term laboratory studies.

B. Fibrous Glass (7)

Fibrous glass is categorized according to fiber diameter. The primary health effects associated with fibers larger than 3.5 micron diameter are skin, eye and upper respiratory tract irritation, a relatively low incidence of fibrotic (lung) changes, and preliminary indications of slight excess mortality risk due to non-malignant respiratory diseases. In this regard, NIOSH considers the hazard potential of fibrous glass to be greater than that of nuisance dust, but less than that of coal dust or quartz. On the basis of currently available information, NIOSH does not consider fibrous glass to be carcinogenic. However, smaller fibers can penetrate more deeply into the lungs than larger fibers and until more definitive information is available, the possibility of potentially hazardous effects warrant special consideration.

C. Ventilation (8, 9)

Neither NIOSH nor OSHA has developed ventilation criteria for general offices. The only criteria available, used by design engineers, are the guidelines and consensus standards published by ASHRAE.

The guidelines for ventilation rates in commercial and residential buildings are based on a number of research projects carried out in the 1920's and 1930's. The research investigated the ventilation rates required to control body odors in test chambers with comfortable levels of temperature and humidity. It was found that the required ventilation rates varied considerably.

The early ASHRAE standards were based on studies performed before the more modern airtight office buildings became so common. These older buildings probably permitted more natural air infiltration, that is, leakage through cracks and interstices, around windows and doors, and through floors and walls, into the buildings. The modern office buildings are probably much more airtight and probably permit much less air infiltration. Due to the reduced infiltration, it was questioned whether the 1973 ASHRAE minimum ventilation values assured adequate outdoor air supply in modern, airtight buildings.

Subsequently, ASHRAE has revised its standard and has published a new standard in 1981. (ASHRAE 62-1981 "Ventilation for Acceptable Indoor Air Quality".)(8) The new standard is based on an occupant density of seven persons per 1000 square feet of floor area and recommends higher ventilation rates for areas where smoking is permitted. The new ASHRAE standard states that indoor air quality for general offices shall be considered acceptable if the supply of outdoor air is sufficient to reduce carbon dioxide to less than 2,500 ppm and to 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 new standard is 5cfm 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 be 20cfm per person. Areas which are non-smoking may be supplied at the lower rate (5cfm/person) provided that the air is not recirculated from or otherwise enters from, the smoking areas.

D. Relative Humidity (10)

Relative humidity (1) has been shown to have a significant effect on the control of airborne infection. At 50%Rh, the mortality rate of certain organisms is the highest and the influenza virus loses much of its virulence. The mortality rate decreases both above and below this value.

Low relative humidity is undesireable for reasons other than 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 with high temperature (78^{o}F) and low humidity (30^{o}F) places employees in a discomfort zone.

E. Nuisance Dust (11)

In contrast to fibrogenic dusts which cause lung disease when inhaled in excessive amounts, the so-called "nuisance" dusts have a long history of little adverse effect on lungs and do not produce significant organic disease or toxic effect when exposures are kept under reasonable control. The nuisance aerosols have been called biologically "inert", but the latter term is inapproriate to the extent that there is no particulate which does not evoke some cellular response in the lung, inhaled in sufficient amounts. However, the lung-tissue reaction caused by inhalation of nuisance aerosols are generally reversible and produce no scarring or change in lung architecture

Excessive concentrations of nuisance aerosols in the workroom air may seriously reduce visibility (iron oxide), may cause unpleasant deposits in the eyes, ears and nasal passages (Portland Cement dust), or cause injury to the skin or mucous membranes by chemical or mechanical action per se or by rigorous skin cleansing procedures necessary for their removal. The OSHA standard for this type of dust is 15mmg/M^3. The American Conference of Governmental Industrial Hygienists recommends 10 mg/M^3.

VI Results

On July 7, 1981, the airborne concentration of formaldehyde measured in the library, health center, Room 108 ranged frome 0.02 to 0.04 ppm of air sampled. The following morning after no air circulation overnight, the concentrations ranged from 0.05 to 0.10 ppm. When the air fans were activated in the same areas. Levels in other areas ranged from 0.01 to .07 ppm. These levels are lower than might be expected to cause significant eye and upper respiratory irritation.

The levels in all samples taken on February 24th, were below the quantitation of .001ppm of formaldehyde per sample. This was also true for a bulk sample of the plasterboard used in the building.

Relative humidity readings indoors ranged from 60-74% at temperatures of between 69-71°F (wet bulb) and 75-80°F (dry bulb). The outside temperature was 81°F with a relative humidity of 58%. (Table II)

On July 8, 1981 the amount of air entering Room 108 was 308 cubic feet per minute (cfm) for a floor space of 400 square feet. The amount of air coming into the Health Center was approximately 215cfm for a floor space of approximately 462 square feet. At the onset of the health complaints, the outdoor vents were closed. ASHRAE states that leakage of outdoor air with the vents closed would be 5%. Taking this into account, the amount of fresh air coming into these rooms would be 15.4cfm and 10.8cfm respectively or 5.6cfm and 3.8cfm for every 145 square feet per person. ASHRAE recommends that 5cfm of fresh air for non-smokers and 20cfm for smokers per 145 square feet of floor area.

Following the adjustment of the air handling system in the Health Center and the introduction of 50% outdoor air, the amount of air coming into this room on February 24, 1982 was 290cfm and the amount of fresh air was 145cfm. This would be 55cfm per 145 square feet per person in Room 108 and 45cfm per person in the Health Center. These levels would exceed the ASHRAE standards even for smokers.

On September 22nd, 1981, the levels of airborne dust measured ranged from 0.01-0.09 mg/M^3. (Table III) Only trace amounts of fibrous glass were detected. The percentage relative humidity ranged from 29% to 48% in the Student Learning Center and the outdoor was 47%. (Table IV)

Among the 12 employees interviewed on September 22, 1981, all but two had worked in the building since its opening five years previously. Nine had symptoms and three had no complaints. The most prominent symptoms were fatigue, headache, somnolence and loss of concentration towards the end of the working day. These were usually relieved after leaving work and at weekends. Several complained of eye irritation (especially those wearing contact lenses): and others complained of throat irritation. Two had skin irritation or rash. All of those interviewed attributed their symptoms to inadequate ventilation or "contamination of the indoor air" by an unknown substance. The occurrence of symptoms did not seem to be related to age, sex, type of work, length of employment or location in the building. Two employees stated that their symptoms had been greatly relieved following a temporary adjustment of the ventilation system two weeks previously.

On February 24, 1982, nine employees were interviewed. Eight employees felt much better with fewer headaches. One employee complained fatigue in the afternoon.

The eight air samples taken on February 24, following the balancing and adjustment of the air conditioning system had formaldehyde levels below the limit of detection

of the analytical method used 0.001ppm.

VII Conclusion

On the basis of data obtained in this investigation, NIOSH determined that the symptoms reported by the employees could not be readily explained on the basis to exposure to dust or formaldehyde. Many of the symptoms reported may have been caused by (a) lack of make-up air (only approximately 5% leakage when the vents were closed), (b) closing of the air conditioning and air movement units approximately at 2:30 p.m., and (c) personnel and student smoking.

Following the increase in outside make-up air to 100% and balancing of the air handling system to get a more equal distribution of air throughout the building, some of the health complaints eased. Eight of the nine employees stated that there was a marked improvement in air quality, although some people stated they became tired in the afternoon. They could not attribute this feeling to any specific causative agent.

VIII Recommendations

1) The air conditioning system should be balanced to ensure good distribution of air with appropriate amounts of make-up air. ASHRAE guidelines are 10-15 cubic feet of ventilation air per human occupant for classrooms combined with 5cfm per person for non-smokers and 20cfm per person for smokers of outdoor air.

2) Maintain health surveillance cooperatively with the employees.

IX Authorship and Acknowledgement

Report prepared by:

Walter J. Chrostek
Regional Industrial Hygienist
Project Leader, HETAB, NIOSH

Richard A. Keenlyside, M.D.
Chief, Medical Section, HETAB
Cincinnati, Ohio

Originating office:

Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluation and Field Studies
Cincinnati, Ohio

Report typed by:

Mary R. Tomassini, Secretary
NIOSH/Region III, Philadelphia, PA

Acknowledgements

Laboratory analysis: Utah Biological Test Laboratory
Salt Lake City, UT
NIOSH, MSB
Cincinnati, Ohio

Special Acknowledgment

Field assistance: Maurine G. Banner, Industrial Hygienist
Pennsylvania State University

X Distribution and Availability

Copies of this report are currently available upon request from NIOSH, Division Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, OH 45226. After 90 days, the report will be available through the National Technical Information Service Service (NTIS), Springfield, VA.. 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. Pennsylvania State University, State College, PA
2. Penn State University, DuBois, PA
3. NIOSH, Region III

XI References

1. NIOSH Manual of Analytical Methods, Vol. 1 (NIOSH) Publication #77 157A, Vol. 7, (NIOSH) Publication #82 100
2. U.S. Department of Labor, Occupational Safety and Health Administration, Federal Register, Vol. 39, #125, June 27, 1974, (Revised Nov. 7, 1978)
3. NIOSH Criteria for a Recommended Standard, Occupational Exposure to Formaldehyde, Publication #77 126, December 1976 (NIOSH)
4. Formaldehyde - An Assessment of its Health Effects, Committee on Toxicology Report to Consumer Products Safety Commission, Nat. Acad. Sci., March 1980
5. Occupational Diseases: A Guide to Their Recognition, USPHS, CDC, NIOSH Publication #77 181, Revised June 1977
6. NIOSH Criteria for a Recommended Standard, Occupational Exposure to Fibrous Glass Publication #77 152, April 1977
7. ASHRAE Standard 62-1981, "Ventilation for Acceptable Indoor Air Quality", American Society of Heating, Refrigeration and Air-conditioning Engineers, Inc., Georgia 1981
8. ASHRAE Handbook & Product Directory, American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc., Georgia, 1976, 1978
9. W.J. Hitschler: Humidification Indoors in the Winter, Archives of Otolarynology,

TABL

Penn State University
DuBois Campus
DuBois, Pennsylvania

HETA 81 315

July 7-8, 1981

Airborne Concentrations of Formaldehyde

Date	Sample No.	Location	Sample Period	Concentration*	Remarks
7/7/81	1	Room 108	09:29-12:43	0.017	
	2	Library	09:48-13:29	0.024	
	3	Health Services	10:07-13:09	0.031	
	4	Room 108	12:50-15:32	0.024	
	5	Health Services	13:27-15:21	0.029	
	6	Librarians Office	13:41-15:32	0.036	
7/8/81	7	Room 108	06:56-08:00	0.073	No air conditioning
	8	Library	06:57-07:58	0.099	No air conditioning
	9	Health Center	06:59-08:02	0.053	No air conditioning
	10	Room 102	07:01-07:58	0.059	No air conditioning
	11	Book Store	08:15-14:20	0.067	
	12	Library	08:25-14:36	0.021	
	13	Room 101	08:32-14:22	0.015	
	14	Room 106	08:38-14:31	0.013	

Evaluation Criteria*

Substance	OSHA	NIOSH
Formaldehyde	3	Lowest Feasible Limit

*Denotes parts per million parts of air.

TABLE II

PENN STATE UNIVERSITY
DU BOIS CAMPUS
DU BOIS, PENNSYLVANIA

HETA 81-315

JULY 8, 1981

LOCATION	TIME	Temperature Degrees Fahrenheit WET BULB	DRY BULB	% RELATIVE HUMIDITY
Room 102	10:05	70.5	79	66
Library	10:10	70	77.5	69
Library Work Room	10:15	70	78	67
Room 106	10:15	71.5	80	66
Book Store	10:22	69.5	78.5	64
Health Center				
Reception	10:26	70	76	74
Drug	10:30	69	76	70
Treatment	10:33	69	75	74
Room 108	10:37	69	79	60
Outdoors 2nd Floor Entrance	11:10	70	81	58

TABLE III

Penn State University
Du Bois Campus
Du Bois, Pennsylvania

HETA 81 315

September 23, 1981

Temperature Degrees Fahrenheit

LOCATION	TIME	WET BULB	WET BULB	% RELATIVE HUMIDITY
Reception Desk	14:45	56	70	40
Health center	14:55	57	73	35
Outdoors (Ground Level)	15:05	47	57	45
Book Store	15:15	58	70	48
Library (Checkout)	15:20	56	74	29
Room 108	15:30	57	73	35
Room 132 (Continuous Education)	15:50	61	74	47
Outdoors (100 level)	16:05	49	59	47

TABLE IV

PENN STATE UNIVERSITY
DU BOIS CAMPUS
DU BOIS PENNSYLVANIA

HETA 81 315
SEPTEMBER 23, 1981

TOTAL AIRBORNE DUST IN WORK ENVIRONMENT
(Containing Fibrous Glass)

SAMPLE#	LOCATION	TIME	AIRBORNE CONCENTRATIONS*
7790	Library Workroom	10:40 - 16:55	0.01
7787	Room 102	10:42 - 16:55	0.01
7773	Health Center (Waiting Room)	10:50 - 15:45	0.03
7792	Book Store (Office)	10:55 - 16:50	0.04
7795	Room 108	11:00 - 16:40	0.09
7788	Room 106	11:00 - 16:55	0.01

*Denotes milligram of dust per cubic meter of air sampled

TABLE V

PENN STATE UNIVERSITY
DuBois Campus
DuBois, Pennsylvania

HETA 81 315

February 24, 1982

Airborne Concentrations of Formaldehyde

Sample #	Location	Sample Period	Concentration*
1	Room 108	08:20-15:15	< .001
2	Room 102	08:21-16:05	< .001
3.	Room 106	08:22-15:57	< .001
4	Health Center (Desk)	08:27-15:50	< .001
5	Book Store	08:25-15:25	< .001
6	Auditorium	08:35-15:28	< .001
7	Health Center (Treatment)	08:37-15:50	< .001
8	Library	08:40-16:28	< .001

* Denotes less than .001 parts formaldehyde per million parts of air.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ROBERT A. TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

Third Class Mail

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF HHS
HHS 396