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SEPTEMBER 1988
OFFICE OF EMPLOYMENT SECURITY
BEAVER FALLS, PENNSYLVANIA

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I. SUMMARY

In April 1988, the Pennsylvania Social Services Union requested the National Institute for Occupational Safety and Health (NIOSH) to conduct a health hazard evaluation at the Office of Employment Security in Beaver Falls, Pennsylvania. The union reported burning of the eyes, nose, and throat; coughing; dizziness; respiratory infections; and other health problems among the office workers. The union suspected that these illnesses were due to some type of indoor environmental problem in the building. The entire floor has no windows, and is partially underground.

On June 14 and 15, 1988, NIOSH investigators conducted an industrial hygiene and medical survey. The NIOSH medical officer conducted private interviews with 17 of the 30 employees. Information was elicited from the workers about their jobs, length of employment, symptoms, and medical and smoking history. Case history details were obtained regarding respiratory infections. The NIOSH industrial hygienist conducted a visual inspection, evaluated ventilation, measured air contaminants, and assessed thermal comfort conditions.

The medical officer interviewed 17 employees, 15 of whom reported eye irritation, 13 malaise, 8 nasal congestion, 8 throat irritation, and 5 cough. Most said their symptoms improved away from the office environment. Six employees reported at least 2 upper respiratory infections in the preceding year, and 2 employees have had pneumonia; there was no medical or epidemiologic information to suggest that these were work-related.

Potential sources of air contaminants in this building included a dry toner type photocopier, fiberglass insulation inside the air supply ductwork, tobacco smoke, cleaning compounds used by the janitorial service, office furnishings and supplies, and building construction materials. An area at the rear of the main office is not reached by ventilation ductwork. The quantity of outdoor air supply to the office area was measured at 950 cubic feet per minute (cfm), which (at 20 cfm/person) would be adequate for the 30 employees plus 17 visitors at a time. Thermal conditions, 72 to 75°F and 48 - 50% relative humidity, met comfort criteria. No unusual types or concentrations of indoor air contaminants were detected. Although a variety of volatile organic compounds were detected in the air, the compounds are ones that are commonly found in indoor air and were measured at concentrations less than any currently contemplated limits for indoor air in the U.S.A.

No documented medical evidence was found to link respiratory illnesses with environmental conditions found in this building. Recommendations are made
in Section VIII of this report to improve the heating, ventilation, and air-conditioning system.

KEYWORDS: SIC 7361 (employment agencies), SIC 9441 (government unemployment offices), indoor air quality, building-related illnesses, tight building syndrome, volatile organic compounds (VOCs), fiberglass

II. INTRODUCTION

On April 27, 1988, the Pennsylvania Social Services Union (PSSU) requested the National Institute for Occupational Safety and Health (NIOSH) to evaluate suspected health hazards in the Beaver Falls Office of Employment Security, where employees were reported to be experiencing dizziness; coughing; burning of the eyes, nose, and throat; recurring respiratory infections; and other symptoms. Poor indoor air quality was suspected.

III. BACKGROUND

The Office of Employment Security is located on the bottom floor (or basement) of a three-story building in downtown Beaver Falls. The building was used in the past as a five-and-dime store, and is currently owned by a pharmacy, which occupies a portion of the middle floor of the building. The remainder of the middle floor, the entire upper floor, and a half sub-basement are unoccupied and empty. The middle floor, where the pharmacy is located, is at street level on the main street of the town. Eleventh Street runs beside the building, and due to a hill, the entry to the bottom floor is from Eleventh Street. Also due to the hillside location of the building, much of the bottom floor (on the Main Street side) is underground. There are no windows on the bottom floor. Office space on the bottom floor is managed by a New Castle, PA, company, which leases most of the floor space to the Office of Employment Security.

The Office of Employment Security (OES) had a total of 30 employees at the time of the NIOSH survey, but employment level varies and can increase with workload of the office. OES has two groups of workers, the Office of Unemployment Compensation, which handles unemployment benefits claims, and the Job Service, which assists in job finding and placement. Virtually all the employees work in a single large room with an open-space office configuration.

Outdoor air, air circulation, and air-conditioning are provided from two air handling units (AHU), which are not connected and which are located in separate side-by-side mechanical rooms. Outdoor air is brought into the building from vents located about five feet above the ground in an alley behind the building, through the wall of the mechanical rooms and directly into the AHUs. To increase the efficiency of the outdoor air intake system, an exhaust fan has been installed on the opposite side of floor (the Main Street side) to pull indoor air out of the building and exhaust it on the roof. The outdoor air supply is a variable volume (economizer) system, designed to vary the quantity of outdoor air supply, depending on outdoor temperature and the building's heating or cooling demands.

According to the building management company officials:

(1) The outdoor air supply is manually set to supply at least a minimum of 1,200 cubic feet per minute (cfm) at all times, though the volume could be greater than this when the variable volume system calls for more outdoor air.

(2) The AHU fans are kept on to circulate air at all times during working hours.

(3) The AHU fans are capable of delivering up to 5,000 cfm of outdoor air.

(4) The exhaust fan is sized to exhaust up to 2,250 cfm of indoor air.

(5) The system uses a permanent metal filter (which must be cleaned regularly) with a 54% filtration efficiency rating.

(6) The heating system is independent of the AHUs and is a hot water baseboard radiant system.

(7) The air-conditioning and the heating system are set on separate thermostats.

(8) Main air supply ducts contain interior fiberglass mat insulation.

The bottom floor was completely renovated for the Office of Employment Security. The building was occupied by the OES in

September 1986, and health complaints have occurred constantly since moving to this building.

The employees are represented by two unions, the PSSU and the AFSCME (American Federation of State, County, and Municipal Employees). A Health and Safety Committee is comprised of the PSSU steward, the AFSCME steward, and employees from both the unemployment and job service offices. Employees are allowed to smoke only in the lunchroom and restrooms, which are equipped with exhaust ventilation to the outdoors.

IV. EVALUATION METHODS

An industrial hygienist and a medical officer from NIOSH conducted an investigation at the facility on June 14 and 15, 1988. An opening conference was held with the manager, the PSSU and AFSCME stewards, and representatives of the building management company. At the opening conference, discussions were held about the health and HVAC (heating, ventilation, and air-conditioning) problems that had occurred at the facility, and about the previous efforts to identify and correct problems, including the hiring of a private environmental consultant.

Following the opening conference, a walk-through survey was conducted throughout the entire building (all three floors, the sub-basement, and the roof) to familiarize the NIOSH investigators with building and environmental conditions, and to determine whether odors, equipment, or substances in other parts of the building could be the source of the problem on the OES floor.

During the survey, the NIOSH medical officer held private interviews with 17 employees. This group included several workers who were referred for interview by the PSSU and AFSCME union officials because they were known to have health complaints, as well as a random sample of the other workers. Additional employees either had no complaints or declined interviews for reasons not revealed to the investigator.

During the interviews, information was elicited from workers concerning their present job title and description, length of employment at the OES, symptoms currently being experienced at work, past medical history, smoking history, and other pertinent data. Specific case history details were obtained regarding episodes of respiratory infections requiring medical treatment, if these had occurred among employees since their move into the office's present location (a time period of approximately 21 months).

The environmental portion of the investigation employed a four-pronged approach - visual inspection, evaluation of ventilation, measurement of air contaminants, and assessment of thermal comfort conditions.

The visual inspection of the physical facilities sought to locate (1) sources of air contaminants; (2) sources of moisture (such as leaking roof, broken plumbing, standing water, or wet surfaces), which might facilitate the proliferation of microorganisms; or (3) operations, equipment stored or abandoned substances, or unsanitary conditions elsewhere in the building which might affect environmental quality in the OES offices.

The evaluation of the HVAC system consisted of an inspection of its components and measurement of the volume of outside air supplied to the floor, carbon dioxide levels inside the office space, and the air volumes handled by each individual supply, return, and exhaust air vent. The HVAC components that were inspected included the air handling units, filters, cooling coils, condensate drainage systems, outside air intakes, exhausts, and duct insulation materials. The measurements of outdoor air supply volumes and supply, return, and exhaust air volumes in each room (except for the exhaust on the roof, which was covered by a large rain cap) were made with a Shortridge Instruments Air Flow Hood. Carbon dioxide levels were measured by two independent methods: Drager direct-reading gas detector tubes, and a Gastech Gastechtor Model 3252 carbon dioxide meter.

Several other air contaminant measurements were made by means of Drager direct-reading gas detector tubes. These tubes were useful for screening for combustion exhaust emissions, such as carbon monoxide (CO) and nitrogen dioxide (NO_2). Detector tubes were also used to sample for formaldehyde and carbon dioxide (CO_2).

To identify any possible air contamination by organic chemical compounds, air was sampled using a charcoal tube collection

technique. Portable, battery-powered air sampling pumps were used to draw air at a rate of one liter per minute (Lpm) through small glass tubes containing 150 milligrams of activated charcoal. Organic chemical compounds were adsorbed on the charcoal. After sampling, the ends of the tube were capped, and the tubes were shipped to the NIOSH analytical laboratory for analysis.

At the laboratory, organics were desorbed from the charcoal with carbon disulfide and screened by gas chromatography, using a flame ionization detector. Since the chromatograms of all the samples were identical, only one sample was analyzed by gas chromatography with a mass selective detector to identify the specific organic compounds. The areas under all peaks were summed to obtain total hydrocarbons. Toluene was used as a standard.

Glass fibers in air were measured using the NIOSH Method 7400 for airborne fibers [NIOSH Manual fo Analytical Methods, Third Edition, DHHS (NIOSH) Publication No. 84-100, 1984]. Samples were collected by drawing air through a 25 millimeter-diameter, cellulose ester membrane filter held in a plastic cassette using the open face configuration. Air was pulled through the filters at a flow rate of 3 liters per minute using calibrated, battery-powered , portable sampling pumps. Samplers were placed on top of desks, file cabinets, or tables. After sampling, the cassettes were closed and sealed, and shipped to the laboratory for analysis. The lab analyzed the samples using phase contrast microscopy, Set A counting rules of NIOSH Method 7400.

To assess thermal comfort conditions, dry-bulb and wet-bulb temperatures were measured throughout the OES floor using a battery-powered psychrometer. This device permitted measurement of ambient air temperature and humidity levels.

V. EVALUATION CRITERIA

Ventilation

Outdoor air (O.A.) supply: The American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) recommends at least 20 cubic feet per minute (cfm) O.A. per person for office areas. [ASHRAE Standard 62-1981R (Proposed); Ventilation for Acceptable Indoor Air Quality, July 15, 1986]

Carbon dioxide (CO_2) buildup:

Carbon dioxide (CO_2) is a normal constituent of exhaled breath and, if monitored, can be used as an indicator of whether adequate quantities of fresh outdoor air are being introduced into a building or work area. The outdoor, ambient concentration of CO_2 is usually 250-350 ppm. Usually the CO_2 level is higher inside than outside, even in buildings with few complaints about indoor air quality. However, if indoor CO_2 concentrations are more than 1000 ppm (3 to 4 times the outside level), there is probably a problem of inadequate ventilation, and complaints such as headaches, fatigue, and eye and throat irritation may be present. The CO_2 concentration itself is not responsible for the complaints. However, a high concentration of CO_2 may indicate that other contaminants in the building may also be increased and could be responsible for occupant complaints. If CO_2 concentrations are maintained below 600 ppm, with comfortable temperature and humidity levels, complaints about air quality should minimal. If CO_2 levels are greater than 1000 ppm, comfort and health complaints may occur, and thus 1000 ppm should be used as an upper limit guideline. This does not mean that if this level is exceeded the building is hazardous or that it should be evacuated, but rather this level should be a guideline that helps maximize comfort for all occupants. Levels between 600 ppm and 1000 ppm are less clearly interpreted. (Guidance for Indoor Air Quality Investigations, NIOSH, Hazard Evaluations and Technical Assistance Branch, January 1987)

The assessment that building ventilation should be considered inadequate when indoor CO_2 levels exceed 1,000 ppm is also recognized by other organizations. The World Health Organization (WHO) suggests 1,000 ppm as a general indicator of the presence of indoor air pollution (WHO Working Group; Health Aspects Related to Indoor Air Quality, EURO Reports and Studies 21, pp 1-21; World Health Organization, Regional Office for Europe, Copenhagen, 1979). ASHRAE's recommended O.A. ventilation rates are intended to maintain CO_2 levels below 1,000 ppm.

Air Contaminants

Volatile organic compounds (VOCs) is a term used to express the sum of all the organic vapor compounds measured in the air. There are no official guidelines for indoor VOC levels to use for comparison purposes. The U.S. Environmental Protection Agency (EPA) had a national ambient air quality standard of 160 micrograms per cubic meter of air (ug/m^3) for hydrocarbons (measured as an average 3-hour concentration from 6AM to 9AM). This value might best be viewed as a national goal to reduce hydrocarbon pollution levels in outdoor air. The Indoor Environmental Quality Committee of the American Industrial Hygiene Association (AIHA) is developing a guidance document on indoor air quality. The AIHA committee is contemplating 5 milligrams per cubic meter (mg/m^3) (which equates to 5,000 ug/m^3) of VOCs in indoor air as a guideline limit. It must be pointed out that this guideline is merely a draft at this time and has no official status as an AIHA recommendation. Several indoor air officials at EPA have informally told us that they believe 1 mg/m^3 (1,000 ug/m^3) is probably a reasonable limit for VOCs to prevent irritation affects, on the basis of the work of one researcher in Denmark. The 1,000 ug/m^3 is not an official EPA recommendation or policy. EPA is preparing research studies where human volunteers will be exposed to a mixture of typical indoor VOCs (excluding those classified as carcinogens by an international agency) to verify the results of the Danish Study.

Fibrous glass particles in the air may produce temporary irritation of the eyes, nose, skin, and upper respiratory system. These irritation symptoms may be sensed as prickling, burning, or itching. Mechanical irritation of the skin may cause a temporary rash that is usually observed at pressure points between the skin and the clothing, such as at the waist, collar, and wrist. Although this skin irritation usually diminishes after several days of exposure, some workers do not acclimate to these irritant effects, and may find continued exposure intolerable. NIOSH recommends that worker exposure should not exceed 3 million fibers per cubic meter. NIOSH further specifies that fibers to be counted should consist of those less than or equal to 3.5 micrometers in diameter, and greater than or equal to 10 micrometers in length.

Thermal Comfort Conditions

ASHRAE has published guidelines for thermal environmental conditions which take into account temperature, humidity, and seasonal clothing worn by office workers (ASHRAE Standard 55-1981, Thermal Environmental Conditions for Human Occupancy). Acceptable temperatures (found to be comfortable or acceptable for 80% or more or the occupants at 50% relative humidity) are specified for winter and summer.

Season	Typical Clothing	Optimum Temp.	Acceptable Range
Winter	heavy slacks long sleeve shirt sweater	71°F	68 - 74.5 °F
Summer	light slacks short sleeve shirt	76°F	73 - 79 °F

ASHRAE expresses the acceptable humidity range in terms of a 35°F minimum dew point temperature and a 62°F maximum dew point temperature. This equates roughly to a 30-60% relative humidity (R.H.) range. Since % R.H. is more commonly understood in expressing humidity conditions, % R.H. is used in this report to facilitate understanding.

Microorganisms

Guidelines for assessment of microorganism contamination in buildings have been published by the American Conference of Governmental Industrial Hygienists (ACGIH) (Guidelines for assessment and sampling of saprophytic bioaerosols in the indoor environment; Applied Industrial Hygiene, pp. R-10 - R-16, Sept. 1987). These guidelines suggest an initial assessment to identify potential microorganism sources and to review any respiratory illnesses among employees. If plausible sources are found where microorganisms may be proliferating (particularly wet surfaces, standing water, decaying matter), or if there is visible mold, remedial action is needed to eliminate growth sources and remove the threat of microorganism proliferation; however, further field investigation is not required in the absence of medical evidence of related disease. Only if positive medical evidence is found of diseases that are plausibly related to biologic contamination (such as humidifier fever, hypersensitivity pneumonitis, or Legionnaires Disease) is further assessment of microorganisms warranted.

VI. FINDINGS

Visual Inspection

Potential sources of air contaminants in this building include a dry toner-type photocopier, fiberglass insulation inside the air supply ductwork, tobacco smoking (designated, exhaust-ventilated areas only), cleaning compounds used by the janitorial service, office furnishings and supplies, and building construction materials. No dampness, standing water, or leaks were found, so no plausible growth sources of microorganisms were identified. The unused areas of the building (including other floors) were vacant and clean.

Ventilation

The office workers complained that the most stuffy and uncomfortable conditions were in the "back of the office", the rear area of the large main room that is furthest away from the entry door and hall. The entire area within 12 feet of the rear wall is not reached by the ventilation ductwork, and is therefore probably one of the most poorly ventilated areas. A building management company official stated that the ceiling height drops in this area due to a drop in the above floor level, not permitting space for ductwork. This poorly ventilated area was the location for the office's only photocopying machine.

Ventilation flow hood measurements indicated some imbalance in the air supply/return system, and some poorly-functioning or non-functioning vents. In the suite of conference rooms (adjacent to the outer hallways and near the public restrooms), ventilation supply rates were low and there was only one return air vent in the whole area. Although this area was comfortable during the survey, when the area was unoccupied, conditions could possibly be uncomfortable there if it were used by large groups of people.

The location of the outdoor air (O.A.) vents in the alley is generally poor due to the possibility of vehicle exhaust pollution. A location higher above street level would generally be preferable.

The north O.A. intake was not functioning properly. Flowhood measurements and a visible smoke test indicated that 200 cfm of

indoor air was exhausting through the O.A. intake.

The flowhood measured 950 cfm O.A. being supplied by the south air handling unit. At 20 cfm/person, 950 cfm would be adequate for 47 persons. This would accomodate the 30 employees plus up to 17 visitors at a time.

Carbon dioxide levels indicate adequate fresh air supply and adequate air exchange between the building and the outdoors. Carbon dioxide levels were 600 ppm or less except at one time during a morning when 25 to 30 visitors were in the offices.

The air handling units were generally clean. (The filters had been cleaned the day before the NIOSH survey began.) The air-conditioning (A/C) cooling coils appeared clean. A small amount of sediment was observed in the condensate pan.

The north A/C compressor does not operate as frequently as the south A/C compressor. The condensate drain pan and cooling coils were dry when inspected. During each of the two days of the survey, the compressor ran at least part of the day, as evident by the drainage of condensate on the ground in the alley. Perhaps the larger capacity of the south A/C unit was able to supply most of the cooling demanded by the system.

Comfort Conditions

The temperature range in the office was 72 to 75 °F. The humidity range was 48 to 50% R.H. (Table 1). These conditions fall within the range considered comfortable for most office workers wearing light summer clothing.

Air Contamination

No carbon monoxide or nitrogen dioxide were detected (within the measuring range of the indicator tubes), indicating the absence of significant gaseous combustion by-products in the air.

Possibly a trace of formaldehyde was present. A color change was detectable on the indicator tube, but not the usual pink color characteristic of formaldehyde. A pale tan discoloration was observed with perhaps a slight pink hue. The color change may have been due to the presence of another organic compound in the air which reacted with the indicator. The discoloration could only be observed when the capacity of the indicator tube was extended to its absolute limit of detection (using 100 pump strokes, 10 liters of air, and a special activation tube) (5 to 10 times the normal amount
of air sampled). If the color change observed was due to formaldehyde, the quantity present would be in the range of 0.04 to 0.06 ppm (the first scale graduation on the indicator). (A private consultant had previously conducted formaldehyde sampling using a wet chemical chromatropic acid method with laboratory analysis. The results were in the range 0.02 to 0.03 ppm.)

Charcoal tube samples were taken to determine whether any unusual organic air contaminants could be detected. Toluene was the single largest component. Other compounds detected included butanes, hexanes, heptanes, octane, 1,1,1-trichloroethane, xylenes, pinene, limonene, and decamethylcyclopentasiloxane. All of these compounds are commonly found in indoor air, and were not present at unusual levels.

The quantity of total volatile organic compounds (VOC's) was computed by summing the areas of all peaks of the chromatogram, using toluene as the standard. Results are shown in Table 2. The concentration of toluene in the air ranged from 17 to 19 ug/m^3 and was less than one ten-thousandth of the occupational exposure limit. Total VOC concentrations were approximately 200 ug/m^3 and were only about 4% of the 5,000 ug/m^3 potential guideline level. The compounds were collected on activated charcoal, desorbed at the laboratory using carbon disulfide, separated and identified by gas chromatography using a mass selective detector, and quantified by gas chromatography using a flame ionization detector. There are other methods which may be employed to collect and analyze VOCs, and the results could differ depending on such parameters as collection and recovery efficiencies, sample stability, and compounds used in analytical standards.

Fiberglass contamination of the air, if present, was not detectable in either the Job Service or Unemployment Bureau areas (Table

3). The analytical method was capable of detecting 3,000 fibers on the filter used for sampling. For a sampling volume of 1,300 liters of air (1.3 cubic meters), the limit of detection would equate to 2,300 fibers per cubic meter of air. If lower concentrations were present, they would not be detected by the method used.

Symptoms of mucous membrane irriation were the health problems most frequently reported by the employees. Among the 17 employees interviewed, the symptoms which were reported as worse at work were: eye irritation by 15 (89%) of the employees; malaise, 13 (76%); nasal congestion, 8 (47%); throat irritation, 8 (47%); cough, 5 (29%); and visual blurring, 4 (24%). The majority of employees interviewed related the onset of symptoms they were currently experiencing to a time period shortly following their occupancy of the building. Three or fewer workers complained of dizziness, dry skin, headaches, nausea, shortness of breath, or wheezing. Many workers stated that they believed that their symptoms were due to what they described as an inadequate supply of air in the building. The majority of workers also stated that usually within one hour of leaving the building, their symptoms had either greatly improved or completely resolved.

A total of six employees reported having at least 2 episodes of upper respiratory infections during the preceding year, and there were also 2 documented cases of pneumonia, both of which occurred since January 1987. Sputum cultures were not obtained in either case, so the specific etiologic agent is unknown, but information obtained from the workers' physicians was consistent with bacterial pneumonia. In neither case was the diagnosis of Legionnaires disease, humidifier fever, or hypersensitivity pneumonitis made.

VII. CONCLUSIONS

The symptoms of mucous membrane imitation and fatigue which were prevalent among employees are not specific enough to attribute to an identifiable causative agent. Most upper respiratory infections are caused by viruses. They are spread by direct contact, by inhalation of airborne droplets, or indirectly by hands or articles freshly contaminated by discharges from the nose or throat of an infected person. Contact with a large number of people increases the probability of exposure to someone with an upper respiratory infection, and crowding increases the likelihood of transmission. There was no medical evidence to support any association between work-related exposures and the cases of pneumonia among employees.

Potential sources of air contaminants in this building were a dry toner-type photocopier, fiberglass insulation inside the air supply ductwork, tobacco smoking (in designated, exhaust-ventilated enclosed areas), and cleaning compounds used by the janitorial service. Air contaminants could also be released by office furnishings and by construction materials in the building. However, no unusual levels of air contaminants were measured. Concentrations were far less than occupational health exposure limits.

An area in the rear of the main room was not served by ventilation ductwork, and this area was considered most stuffy and uncomfortable by employees. The outside air supply to the offices was adequate (at 20 cfm/person) for the 30 employees and up to 17 visitors at a time. Some HVAC system problems were discovered, though not likely to contribute substantially to the health problems of the employees. Temperature and humidity (72 to 75°F, 50% R.H.) conditions fell within the ranges considered by ASHRAE as comfortable or acceptable for most office workers.

VIII. RECOMMENDATIONS

Although we could not attribute symptoms to the specific environmental conditions which we evaluated in this particular building, it is recommended that action be taken to insure the optimum functioning of the HVAC system in accordance with the criteria described in this report, and the specific recommendations that follow.

1. Have a qualified HVAC contractor test and adjust the outdoor air (O.A.) intake on the north AHU to insure that O.A. is being drawn into the building by this unit. Verify the direction (inward) and volume of air flow.

2. Increase O.A. supply volume to a quantity at least equal to 20 cfm multiplied by the sum of the number of employees plus the maximum number of visitors on the floor at any given time.

3. Inspect and correct HVAC supply and return imbalances, particularly those vents with little or no flow.

4. Have a qualified HVAC contractor review the return air system in the interview/conference area suite adjacent to the outer hallway. (Only one return vent was positioned in this entire area at the time of the survey.)

5. Accumulated sediment should be removed from the A/C condensate pans each time the filters are cleaned. Removal by scraping out is preferable to flushing, so that the drainage line does not become plugged.

6. Since it has been demonstrated that CO_2 levels of 600 ppm or less are achievable in this building, CO_2 levels should continue to be maintained to 600 ppm or less to assure adequate O.A. ventilation. Periodic monitoring of CO_2 levels would be prudent.

7. Humidity levels should be measured during the winter. Sling psychrometers or battery-powered psychrometers employing wet and dry bulb thermometers are reliable measuring devices.

8. During winter, insure that A/C thermostats are set several degrees higher than the heat thermostats to reduce the likelihood of unnecessary A/C operation during the winter. A/C operation during winter may cause chilling of employees whose workstations are near HVAC supply vents.

9. Tempering O.A. intake during winter may be necessary if cold drafts under supply vents cause significant discomfort.

10. Because the ventilation ductwork does not extend into the back of the office, the area may require special efforts to provide adequate ventilation.

    Options include:
    (a) adding supplemental ventilation for this area, or

    (b) designating this area for storage or files rather than for employee workstations.

    The photocopier should probably be moved to a better ventilated area, preferably a room equipped with an exhaust to the outdoors.

11. Run HVAC system fans throughout working hours to provide for continuous air circulation.

12. Prohibit vehicles from stopping in the alley where the air intakes are located, or move air intake vents to roof.

13. Due to the recirculating-type HVAC system, smoking should be prohibited in the building to minimize employee exposure to environmental tobacco smoke. A less effective alternative is to continue the present practice of restricting smoking to areas equipped with exhaust vents directly to the outdoors.

14. To reduce eye symptoms, headaches, and musculoskeletal discomfort among video display terminal (VDT) users, implement NIOSH ergonomic recommendations for VDT usage. (National Institute for Occupational Safety and Health. Potential Health Hazards of Video Display Terminals. Cincinnati, Ohio: National Institute for Occupational Safety and Health [DHHS (NIOSH) publication 81-129], 1981.)

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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Copies of this report have been sent to:

1. Office of Employment Security, Beaver Falls, PA
2. Pennsylvania Social Services Union
3. American Federation of State, County, and Municipal Employees
4. Castle Management Corporation
5. Appropriate health and safety agencies of the State of Pennsylvania
6. U.S. Department of Labor, OSHA, Region III

For the purpose of informing affected employees, copies of this report must be posted by the employer in prominent places in the facility where it will be accessible to the employees for a period of 30 calendar days.

TABLE 1
Environmental Measurements
Office of Employment Security
Beaver Falls, Pennsylvania
HETA 88-274
June 14-15, 1988
Temperature and Humidity Levels

Time	Dry Bulb Temp	Wet Bulb Temp.	Relative Humidity
4:15 PM June 14	74 - 75°F	61 - 62°F	48%
10:00 AM June 15	72 - 74°F	60.5 - 62°F	50%
1:15PM June 15	75 - 75.5°F	62.5 - 63.5°F	49-50%

Air Contaminant Measurements

Carbon Dioxide

	Time	Concentration
June 14	2:30PM	500 - 600 parts per million (ppm)
	4:00PM	500 - 600 ppm
June 15	9:30AM	600 - 800 ppm
	noon	600 ppm
	1:30PM	600 ppm
	4:00PM	600 ppm

Carbon Monoxide

only a trace detected (less than 1 ppm)

Nitrogen Dioxide

none detected

Formaldehyde

possibly 0.04 to 0.06 ppm
(color change not characteristic of formaldehyde;
indication noted at the lowest scale division on the detector tube)

Outdoor Air Supply

Southern AHU 950 cfm incoming into the system
Northern AHU 200 cfm indoor air exhausting through the outdoor air intake vent
AHU: Air handling unit cfm: cubic feet per minute

TABLE 2

Organic Vapor Sampling Results

Office of Employment Security
Beaver Falls, Pennsylvania
HETA 88-274

June 15, 1988

Sampling Location	Air Contaminant Concentration (ug/m^3)	
	Toluene	Total Volatile Organic Compounds (VOC's)*
1. Job Service main office	19	216
2. Unemployment Bureau main office	17	187
3. Back of room (the rear section of the large room)	17	183
Evaluation Criteria:	375,000 (NIOSH)	5,000 (draft, AIHA)

Units:

ug/m^3: micrograms of contaminant per cubic meter of air

Note:
*Individual compounds detected were butanes, hexanes, heptanes, octane, toluene, 1,1,1-trichloroethane, xylenes, pinene, limonene, and decamethylcyclopentasiloxane. Toluene, the largest single component, was used as the analytical standard.

TABLE 3

Fibrous Glass Sampling Results

Office of Employment Security
Beaver Falls, Pennsylvania
HETA 88-274

June 15, 1988

Sampling Location	Fibrous Glass Concentration (fibers per cubic meter of air)
Job Service main office space	Not detected *
Unemployment Bureau main office space	Not detected *
Evaluation Criterion	3,000,000 (NIOSH) **

* The lowest concentration that could be detected (limit of detection) by the method used was 2,300 fibers per cubic meter.

** NIOSH recommends that fibers less than or equal to 3.5 micrometers in diameter, and 10 micrometers or greater in length, be counted.