DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Region 1
John F. Kennedy Federal Bldg.
Government Center
Boston, MA 02203

October 8, 1992

RE: HETA 92-168

Mr. John M. Robinson, Director
Department of Employment & Training
Jesse Metcalf Building
101 Friendship Street
Providence, Rhode Island 02903

Dear Mr. Robinson:

On March 3, 1992, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Union President, Local 401, SEIU, Rhode Island Employment Security Alliance, AFL-CIO, to conduct a Health Hazard Evaluation (HHE) and evaluate the indoor air quality at the Rhode Island Department of Employment and Training, 101 Friendship Street, Providence, Rhode Island. In response to this request, I conducted on-site surveys of your work place on June 30 and July 1, 1992.

This letter summarizes my activities and observations during those surveys, presents the results from environmental monitoring, and provides recommendations to improve the indoor air quality.

I. INTRODUCTION

The request letter stated that employees were experiencing headaches, eye irritation, allergic reactions, sore throats, cough, chest pain and lethargy, as well as non-specific upper-respiratory ailments. The Union believed these conditions were due to poor indoor air quality caused by an inadequate ventilation system. The request letter also stated that employees may be potentially exposed to pesticides.

Following an opening conference on June 30 with management representatives, the Union President, and the Union Shop Steward, a walk-through survey of the 4th floor of the building was conducted. On July 1, the survey continued with evaluations of the remaining employee occupied floors, (third, second and first), as well as a visual inspection of the air handling units located on the roof.

II. BACKGROUND

For approximately 100 years, the building currently occupied by the Department of Employment and Training served as a jewelry manufacturing establishment. In 1990, the Department of Employment and Training began to occupy this facility. There have been no major renovations of this building since 1990.

The building is owned by Pine Street Realty and is managed by Hallmark Properties, Cranston, Rhode Island. A private subcontractor maintains all heating, ventilation and air-conditioning (HVAC) equipment.

There are approximately 350 individuals working within the Department of Employment and Training. Complaints of poor health and poor indoor air quality surfaced when these employee's first occupied this building.

Another area of employee discontent was pesticide application. Spraying, in order to eliminate insects, was accomplished using an agent called Dursban. Spraying was conducted on weekends, and was performed on an "as needed" basis. Employee representatives suggested that a substitute pesticide agent be used, which was less toxic, and consequently spraying with Dursban was stopped. An entomologist is currently reviewing the insect infestation problem to identify the specific insect pest, and recommend a more specific, less toxic pesticide. Management is awaiting his report, before resuming pesticide application.

On January 22, 1991, an inspection of the Department of Employment and Training was performed by the Rhode Island Department of Labor, Division of Occupation Safety. Fifteen (15) alleged safety and health violations were recorded and included violations involving: (1) means of egress, (2) poor housekeeping, (3) lack of adequate first aid facilities, (4) lack of caution signs to warn against potential unsafe practices, and (5) inappropriately used and guarded electrical equipment.

with double distilled water, capped, thoroughly mixed, and transferred to a plastic bottle.

The sample was analyzed on a Perkin Elmer 5000 flame atomic absorption spectrophotometer. Each standard, sample, and blank was manually injected into the nebulizer. Absorbance was measured using an integration time of four seconds. The maximum sensitivity was obtained by using an impact bead and an analytical line of 283.3 nm. The acetylene to air ration was 25 to 38 and the slit height was 0.7 nm.

A computer software package was used to generate a linear calibration curve, automatically calculated the LOD/LOQ values, and automatically calculate the lead concentration of the sample based on the calibration curve. The reported values were not corrected against the reagent blank.

IV. EVALUATION CRITERIA

A) General Overview

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ 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, if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, 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 adverse 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 mucous membranes; thus, such contact may contribute to the overall exposure. Finally, 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,[1] (2) the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values[2] (TLVs), and (3) the United States Department of Labor/Occupational Safety and Health Administration (OSHA) occupational health standards[3]

(Permissible Exposure Limits - PELs). Often, the NIOSH recommendations and ACGIH TLVs are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLVs usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the economic feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended exposure limits (RELs), 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, it should be noted that industry is required by the Occupational Safety and Health Act of 1970 (29 CFR 1910) to meet those levels specified by an OSHA standard. A time-weighted average (TWA) exposure refers to the average airborne concentrations of a substance during a normal 8-10 hour workday. Some substances have recommended short-term exposure limits (STELs) or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high, short-term exposures.

B) Indoor Air Quality

A number of published studies have reported high prevalence of symptoms among occupants of office buildings.[4-8] NIOSH investigators have completed over 1,100 investigations of the indoor environment in a wide variety of settings. The majority of these investigations have been conducted since 1979.

The symptoms and health complaints reported by building occupants have been diverse and usually not suggestive of any particular medical diagnosis or readily associated with a causative agent. A typical spectrum of symptoms has included headaches, unusual fatigue, varying degrees of itching or burning eyes, irritations of the skin, nasal congestion, dry or irritated throats and other respiratory irritations. Typically, the workplace environment has been implicated because workers report that their symptoms lessen or resolve when they leave the building.

Scientists investigating indoor environmental problems believe that there are multiple factors contributing to building-related occupancy complaints.[9,10] Among these factors are imprecisely defined characteristics of heating, ventilating, and air-conditioning (HVAC) systems, cumulative effects of exposure to low concentrations of multiple chemical pollutants, odors, elevated concentrations of particulate matter, microbiological contamination, and physical factors such as thermal comfort, lighting, and noise.[11-16] Reports are not conclusive as to whether increases of outdoor air above currently recommended amounts ($\leq$ 15 cubic feet per minute per person) are beneficial.[17,18] However, rates lower than these amounts appear to increase the rates of

complaints and symptoms in some studies.[19,20] Design, maintenance, and operation of HVAC systems are critical to their proper functioning and provision of healthy and thermally comfortable indoor environments. Indoor environmental pollutants can arise from either outdoor sources or indoor sources.[21]

There are also reports describing results which show that occupant perceptions of the indoor environment are more closely related to the occurrence of symptoms than the measurement of any indoor contaminant or condition.[22-24] Some studies have shown relationships between psychological, social, and organizational factors in the workplace and the occurrence of symptoms and comfort complaints.[24-27]

Less often, an illness may be found to be specifically related to something in the building environment. Some examples of potentially building-related illnesses are allergic rhinitis, allergic asthma, hypersensitivity pneumonitis, Legionnaires' disease, Pontiac fever, carbon monoxide poisoning, and reaction to boiler corrosion inhibitors. The first three conditions can be caused by various microorganisms or other organic material. Legionnaires' disease and Pontiac fever are caused by Legionella bacteria. Sources of carbon monoxide include vehicle exhaust and inadequately ventilated kerosene heaters or other fuel-burning appliances. Exposure to boiler additives can occur if boiler steam is used for humidification or is released by accident.

Problems NIOSH investigators have found in the non-industrial indoor environment have included poor air quality due to ventilation system deficiencies, overcrowding, volatile organic chemicals from office furnishings, machines, structural components of the building and contents, tobacco smoke, microbiological contamination, and outside air pollutants; comfort problems due to improper temperature and relative humidity conditions, poor lighting, and unacceptable noise levels; adverse ergonomic conditions; and job-related psychosocial stressors. In most cases, however, no cause of the reported health effects could be determined.

Standards specifically for the non-industrial indoor environment do not exist. NIOSH, the Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) have published regulatory standards or recommended limits for occupational exposures.[28-30] With few exceptions, pollutant concentrations observed in the office work environment fell well below these published occupational standards or recommended exposure limits. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has published recommended building ventilation design criteria and thermal comfort guidelines.[28-29] The ACGIH has also developed a manual of guidelines for approaching investigations

of building-related complaints that might be caused by airborne living organisms or their effluents.[30]

Measurements of indoor environmental contaminants has rarely proved to be helpful in determining the cause of symptoms and complaints except where there are strong or unusual sources, or a proved relationship between a contaminant and a building-related-illness. The usual low-level concentrations of particles and variable mixtures of organic materials found are troublesome to understand. However, measuring ventilation and comfort indicators such as carbon dioxide, temperature and relative humidity, is useful in the early stages of an investigation in providing information relative to the proper functioning and control of HVAC systems.

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The basis for monitoring carbon dioxide, temperature, relative humidity, and carbon monoxide are presented below:

1. Carbon Dioxide (CO_2)

CO_2 is a normal constituent of exhaled breath and, if monitored, can be used as a screening technique to evaluate whether adequate quantities of fresh are being introduced into an occupied space. The ASHRAE Standard 62-1989. Ventilation for Acceptable Indoor Air Quality, recommends outdoor air supply rates of 20 cubic feet per minute per person (cfm/person) for office spaces and conference rooms, 15 cfm/person for reception areas and 60 CFM/person for smoking lounges, and provides estimated maximum occupancy figures for each area.[28]

Figure 1, which is enclosed and which was taken from this document, presents the acceptable ranges of temperature and relative humidity according to ASHRAE. It should be noted that as many as 20% of the occupants, because of individual preferences, may not feel thermally comfortable even if general room temperatures and humidities are within the ASHRAE comfort range.

C) Lead

a) Toxicity of Lead - Health Effects

Lead has been found to have profound adverse effects on the health of workers in the lead industry. Inhalation, the most important source of lead intake, and ingestion result in damage to the nervous, urinary and reproductive systems.[33] The adverse health effects associated with exposure to lead range from acute, relatively mild, reversible stages such as inhibition of enzyme activity, reduction in motor nerve conduction velocity, behavioral changes, and mild central nervous system (CNS) symptoms, to permanent damage to the body and chronic disease.

The signs and symptoms of severe lead intoxication which occur at blood lead levels of 80 micrograms per 100 grams (ug/g) and above are well documented.[33-40] The symptoms of severe lead intoxication include loss of appetite, metallic taste in the mouth, constipation, nausea, pallor, excessive tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pains, fine tremors, numbness, dizziness, hyperactivity, and colic. In lead colic, there may be severe abdominal pain, such that abdominal surgery mistakenly has occasionally been performed.

Evidence accumulated in both adults and children indicates that toxic effects of lead have both central and peripheral nervous system manifestations. The effects of lead on the nervous system range from acute intoxication, coma and cardio-respiratory arrest to mild symptoms, subtle behavioral changes, and electrophysiologic changes associated with lower level exposure. In fact, these effects can occur at blood lead levels of less than 80 micrograms.

With respect to the renal system, it is apparent that kidney disease from exposure to lead is more prevalent than previously believed. The hazard here is compounded by the fact that routine screening is ineffective in early diagnosis. Renal disease may be detected through routine screening only after about two-thirds of kidney function is lost or when manifestation of symptoms of renal failure are present.

Overexposure to lead has profoundly adverse effects on the course of reproduction in both males and females. In the case of male

workers, there is evidence of decreased sexual drive, impotence, decreased ability to produce healthy sperm, and sterility.[34]

The blood lead test is one measure of the amount of lead in the body and is the best available measure of recent lead absorption. The free erythrocyte protoporphyrin (FEP) level is a measure of interference with hemoglobin production at the time the red blood cells are made. Lead affects heme synthetase, the last enzyme in heme synthesis. Although some diseases and iron deficiency anemia can cause a rise in FEP, in a healthy individual working with lead, lead absorption is the most likely cause for such an increase. Further, the FEP level becomes elevated when the blood lead level reaches about 40 ug/dl in men and 30 ug/dl in women, and since the average life span of a red blood cell is 120 days, the FEP reflects the blood lead level over the preceding 3 to 4 months. Normal FEP levels are below 50 ug/dl.

Adults not exposed to lead at work usually have a blood lead concentration less than 30 micrograms per deciliter (ug/dl); the average is less than 15 ug/dl.[33] In 1985, the Centers for Disease Control (CDC) recommended 25 ug/dl as the highest acceptable blood level for young children.[35] Since the blood lead concentration of a fetus is similar to that of its mother, and since the fetus's brain is presumed to be at least as sensitive to the effect of lead as a child's, the CDC advised that a pregnant woman's blood lead level be below 25 ug/dl.[35] Recent evidence suggests that the fetus may be adversely affected at blood lead concentrations well below 25 ug/dl.[36] Furthermore, there is evidence to suggest that levels as low as 10.4 ug/dl affect the performance of children on educational attainment tests, and that there is a dose-response relationship with no evidence of threshold or safe level.[37,38] Lead levels between 40 - 60 ug/dl in lead exposed workers indicate excessive absorption of lead and may result in some adverse health effects. Levels of 60 - 100 ug/dl represent unacceptable elevations which may cause serious adverse health effects. Levels over 100 ug/dl are considered to be extremely dangerous and often require hospitalization and medical treatment.

2. Biological Monitoring Requirements

The OSHA standard[39] requires that the employer institute a medical surveillance program for all employees who are exposed to an air-borne concentration of more than 30 micrograms per cubic meter (ug/M3) of lead dust for more than 30 days a year.

Biological monitoring shall consist of blood sampling and analysis for lead and zinc protoporphyrin and shall be provided for each exposed employee at least every 6 months. It shall be provided at least every 2 months for every employee who had a blood level at or above 40 micrograms per 100 grams (ug/100g) of whole blood. This frequency shall continue until two consecutive

blood samples indicate a blood level below 40 ug/100g of whole blood.

An employer shall remove an employee from his job when the employee's blood level exceeds 60 ug/100g of whole blood. A second follow-up evaluation shall be provided within two weeks after the employee receives the first results. The employee shall return to his former job status when two consecutive blood sampling tests are at or below 40 ug/100g of whole blood.

3. Occupational Standards

The OSHA PEL for lead in air is 50 ug/M3, calculated as an 8-hour time-weighted average for daily exposure. This regulation also requires semi-annual blood lead monitoring of employees exposed to 30 ug/M3 or more of lead. An employee whose blood lead level is 40 ug/dl or greater must be retested every two months and he must be removed from a lead-exposed job if his average blood lead level is 50 ug/dl or more over a 6-month period. A blood lead level of 60 ug/dl or greater, confirmed by retesting within two weeks, requires immediate medical removal. Workers on medical removal should not be returned to a lead-exposed job until their blood lead level is confirmed to be below 40 ug/dl. The standard also recommends that the blood lead levels of employees planning to have children should be kept below 30 ug/dl. Removed workers have protection for wage, benefits, and seniority for up to 18 months until their blood lead levels decline to below 40 ug/dl and they can return to lead exposure areas.

IV. WALK-THROUGH OBSERVATIONS

A) General

Following the opening conference, an evaluation of employee work areas was conducted with environmental data collection. The survey began on June 30 and was concluded on July 1, 1992.

The Department of Employment and Training occupies space on all four floors of a four-story building. Each floor has an area of approximately 23,000 square feet. Ceilings are 16 feet in height. There are 50 to 100 employees working on each floor. The general office environment is an open-space office setting, however, there are many areas where moveable fabric dividers are used. These dividers are either five feet or seven feet in height. There are individual perimeter offices for supervisors and managers. Windows have mini-blinds and can not be opened.

During the renovation of this building, which took place approximately two years ago, sandblasting was performed on all exposed woodwork to remove accumulations of paint and other surface coverings. In some areas of the facility, remnants of unremoved paint are still visible on ceiling areas. Employees

working in these areas, and in particular, on the first floor stated that occasionally debris and dust fall onto their desk areas from the ceiling. They stated that vibration from people walking on the upper floors causes this dust to settle down onto their work areas. The floors in these office areas are covered by carpeting and it is assumed that this carpeting also contains dislodged dust particles, which have settled down from ceiling areas.

B) Ventilation System

Copies of heating, ventilation and air-conditioning (HVAC) system balancing reports, maintenance schedules, including filter changing routines, and cleaning functions, were requested during the opening conference and during the closing conference but have never been received.

Supply and return air ventilation duct work is visible throughout the structure. There is no suspended ceiling. The wall-mounted thermostatic control units which operate supply air are manufactured by either York or Honeywell. Supply ventilation is a hybrid system. Centrally located supply ductwork provides ventilation air to the central areas of the building on all four floors. From these main supply ducts, branches extend outward to the perimeters of the building. The side branches deliver supply air to perimeter offices and other peripheral employee work areas. There are four York thermostatic control units on each floor which regulate supply ventilation air to perimeter locations. Four Honeywell units (one per floor) control supply air to the center of the building.

Perimeter offices and perimeter walls also have convection hot-water heating coils. These convection units can be controlled by thermostats located in each individual office.

Temperature control on the first floor is accomplished by programmable thermostats. Temperature control on floors two through four is accomplished by a remote sensor control system which uses the return air temperature to establish set-points for cooling or heating supply air. Supply air to the main HVAC duct work is maintained at 55 degrees.

There are 20 York air handling units located on the roof of the facility. The minimum stop on these units was stated by maintenance personnel to be set at 5%. However, on examination of these units it was observed that two had their inlet louvers completely closed.

C) Environmental

Employees use electric space heaters under their desks in some areas to control cold temperatures (Mass. Benefits Unit - 1st

floor). Several employees informally stated that there are extreme temperature fluctuations, especially between seasons or on a daily basis in the summer or winter.

In the Providence Area Benefits section (1st floor) a ceiling tile was used to cover a supply ceiling diffuser. At the Benefits Counter (1st floor) many ceiling tiles were missing due to a water pipe that was damaged but has now been repaired. These ceiling panels, however, have not been replaced.

On the third floor a return air grille had accumulations of dirt. Also, in the Employer Register and Termination Area a supply ceiling diffuser was inoperative.

In the mail room employees use 1,1,1 trichloroethylene to clean rollers on the mail sorting machines. Postage inks contain diisooctyl phathalate which must be removed from these rollers on a daily basis. Employees performing this job function have not been trained regarding hazardous chemical exposure, nor are they supplied with gloves or other personnel protective equipment. Storage of this chemical is also random and inappropriate.

In the Management Services Department where "paste-ups and forms design" functions are performed, hazardous chemicals were observed unsecured and unguarded. Six, thirty-two ounce metal containers of Best-Test white rubber cement, which contains n-hexane (CAS 110-54-5403), and two metal, thirty-two ounce, containers of Bestine solvent thinner were randomly stored on a filing cabinet shelf. Both of these products are extremely flammable, and inhalation of their vapors can induce neurological damage. The screw cap on one container was not tightly secured and volatile solvent was leaking.

Employees in this area, who use these chemicals, had never received hazardous chemical training, were unfamiliar with the Rhode Island right-to-know law, and did not know about material safety data sheets.

V. RESULTS

All environmental measurements for temperature, relative humidity, and carbon dioxide are presented in Table I. In the work areas evaluated on June 30 and July 1, 1992, air temperatures were between 72 and 79 degrees F with relative humidities between 42% and 52%.

Carbon dioxide concentrations were measured in all areas where temperature and relative humidity data were obtained. Carbon dioxide concentrations ranged from a low value of 400 parts per million (PPM) to a high value of 1,100 PPM.

In the bulk sample of paint chips, the amount of lead present was 56 mg/g, or 5.6%.

VI. SUMMARY

Areas have been identified within this building where improvements could be instituted. Based on the results of this investigation, it appears that certain inadequacies of the existing ventilation system provide a reasonable explanation for the occurrence and severity of upper respiratory symptoms and the other adverse health conditions mentioned in the request letter. The reduction in dilution ventilation, resulting from inadequate amounts of fresh outside air infusion, and its improper distribution have promoted a buildup of environmental contaminants in general, which may have in turn contributed to the upper respiratory complaints cited by employees, particularly for those employees with pre-existing medical problems, hypersensitivity reactions, or allergies.

The deficiencies identified have been discussed with management and union representatives, along with suggested recommendations regarding the ventilation system. These recommendations should now be addressed by the appropriate management, maintenance and ventilation engineering personnel.

The elevated levels of carbon dioxide (greater than 1,000 PPM in some areas surveyed) are of no health threat. The elevated carbon dioxide levels do, however, provide evidence that fresh air supply should be increased to their areas.

The environmental data indicate that thermal conditions are within the recommended thermal comfort ranges established by ASHRAE (see Figure 1, enclosed). Because of individual preferences, as many as 20% of the occupants of any office environment may not feel thermally comfortable, even if general room temperatures and humidities are within ASHRAE comfort ranges.

A potential for employee exposure to environmental lead exists. This statement is made based on the analytical results of the paint chips procured from the ceiling area on the first floor. It appears that a potential health hazard may exist to employees in the work areas surveyed on the first floor of this facility since dust from the ceiling frequently accumulates on employee desk top areas as well as on carpeting.

VII. RECOMMENDATIONS

1) Several supply and return diffusers had accumulations of dirt on their surfaces and are in need of cleaning. An increase in housekeeping should be instituted to routinely inspect and clean these surfaces.

2) Taping or covering ceiling supply ventilation air diffusers by employees should be discouraged. This process adversely effects the efficiency of the ventilation system. If ventilation air appears excessive in specific employee work areas, then the appropriate ventilation personnel should be notified.

3) The maintenance/engineering staff should purchase several constant recording devices that measure temperature/relative humidity on a continuous basis. Employees stated that they frequently experience extremes in both temperature and relative humidity. These instruments should be maintained in locations where frequent employee complaints of temperature and relative humidity fluctuations have been occurring. With these devices accurate documentation can be maintained so that employee complaints of excessive heat, cold, dryness, or humidity, may be appropriately addressed, and the times for the occurrence of these fluctuations or discomforting events can be more accurately correlated. There are numerous manufacturers. A unit that uses a 24-hour or a 7-day chart is the most useful.

4) Due to the possibility of lead exposure, originating from lead containing paints used in the past to cover ceiling areas, surface monitoring using wipe sampling techniques as well as environmental air sampling based on an 8-hour time-weighted-average (TWA) should be employed for lead exposure. These sampling techniques should be performed throughout the entire facility, particularly in all locations of this building where lead paint has been used and identified to cover the walls or ceiling areas. Depending on these results, and employee exposure levels, it may be necessary to manually clean and vacuum these areas using a high-efficiency particulate air (HEPA) filtering system. (CAUTION - Clean-up, if not properly conducted, may create a worse exposure situation than currently exists.)

   The U.S. Department of Housing and Urban Development (HUD) prepared guidelines for removing lead-based paint which were published in the Federal Register, April 18, 1990, pages 14556-14614. All lead-containing paint should be removed from areas where it is located and these areas repainted with a non-lead containing paint. Contractors, hired to remove the lead paint, should be asked about their qualification, experience removing lead-based paints, and the plans to follow Federal and State lead-paint-removal guidelines.

Furthermore, employees should be provided with a copy of OSHA standard 29 CFR 1910.1025.

As an addition suggestion it is recommended that a referral be made to either the Rhode Island Department of Labor at 401-457-1826 or the Rhode Island Department of Health at 401-277-2438. Either or these state agencies may be contacted and requested to further evaluate potential employee occupational exposures to workplace environmental lead and suggest appropriate abatement measures if necessary.

5) Management should develop and implement a Hazard Communication Program in accordance with OSHA Standard 29 CFR 1910.1200, or the Rhode Island Right-to-Known Hazardous Chemical Program. The Hazard Communication Program will inform and train employees about the hazards associated with the chemicals used and stored at the work place. Containers of hazardous chemicals should also be appropriately labeled as required by the OSHA 1910.1200 Hazard Communication Standard.

   In the Mail Room and in the Paste-Up Area hazardous chemicals are used and stored. There is no hazard communication standard available for review, and there were no material safety data sheets available for the hazardous chemicals used in these areas. Also the employees who work in these areas and use these chemicals have not been trained with regards to hazardous chemical exposures or the adverse health conditions that may result from chemical exposures.

6) The employer should obtain a flammable liquid safety cabinet to store and dispense the flammable liquids identified and used in the "paste-up and forms design area". Currently these flammable liquids are stored in an unprotected, unsecured area.

7) A thorough engineering evaluation of the ventilation system should be conducted by a licensed ventilation engineer to determine the changes necessary to adequately ventilate this facility.

   In some areas ventilation supply rates must be assessed and adjusted to meet the current occupancy requirements. ASHRAE guidelines recommend 20 cubic feet per minute (CFM) of outside supply air per occupant. As building occupant levels increase or decrease in different work areas, ventilation supply air volumes need to reflect these conditions.

Recommendations regarding ventilation system modifications have been discussed. These recommendations should now be addressed and evaluated by the appropriate management, maintenance and ventilation personnel.

Furthermore, the air handling system should adhere to the following items:

a) The HVAC system should be tested and balanced by a licensed ventilation engineer to insure that all employee occupied work spaces are provided with 20 cubic feet per minute (CFM) per person of outside air and that this supplied air is both properly delivered and properly distributed to employee work areas.

b) ASHRAE ventilation guidelines,[28] and ASHRAE comfort guidelines[29] for temperature and relative humidity should also be met.

8) Immediately, and on a continuing basis after HVAC balancing, management should institute and maintain ventilation records and institute a ventilation maintenance program which includes the following elements:

a) Maintenance Schedule - It is important that all HVAC systems and components be inspected and maintained according to a written schedule. Periodic inspection and maintenance (quarterly as a minimum) should include all fans, filters, heating and cooling equipment, including perimeter heating and cooling equipment, humidification equipment and delivery systems, and air delivery systems, such as ductwork and diffusers. Maintenance should include cleaning and/or replacement of filters and cleaning of surfaces inside air handlers and heating/cooling units. When deficiencies are recorded they should be corrected.

b) Management should maintain accurate maintenance and preventative maintenance logs which cover air handler filter changing schedules and other related maintenance operations.

c) Institute a regularly scheduled cleaning maintenance protocol for all ceiling diffusers and returns.

d) Institute a yearly preventative maintenance schedule to include thermostat calibration, visual inspection of HVAC control system operations and an evaluation of floating temperature related set points.

e) Inform appropriate HVAC personnel when redesigning office space or installing new walls or room dividers. When cubicles are established in office spaces, or when new confining walls or room dividers are introduced, building management and HVAC personnel should be consulted and involved so that the rearrangement of employee work cubicles does not block and/or impede the effectiveness of the HVAC system.

f) Environmental Monitoring - If HVAC systems are properly maintained as described in the previous paragraphs, periodic environmental monitoring needs should be limited to measuring the concentration of carbon dioxide, temperature and relative humidity to determine whether systems are performing as designed. A reasonable requirement would be to monitor seasonally, perhaps twice per season routinely, or as needed by your staff if deficiencies are suspected.

9) It is my opinion that management's hesitancy or lack of communication to employees or their representatives concerning the releasing of the results of various survey reports regarding indoor air quality has fueled an anxiety among these employees. While management has made an effort to appraise employees of some ongoing investigations, not all materials have been made available. Employees thus speculate that these neglected materials contain evidence of serious air contamination problems. Consequently, it is my recommendation that all results from all surveys be made available, in summary form, to representatives of the union, and that any employee be permitted to review these reports and materials in their entirety, when requested.

At this time, no further NIOSH action is anticipated regarding this investigation. This letter constitutes the final report of this investigation. In order to comply with our regulations regarding informing affected employees (42 CFR, Part 85.11), this letter must be posted in a prominent place, accessible to all employees, for a period of 30 calendar days. If you have any questions or comments regarding the content of this report, or require additional assistance, please feel free to contact this office directly at (617) 565-1440.

Sincerely yours,

Edward A. Kaiser, Ph.D.

Edward A. Kaiser, Ph.D.
Regional Industrial Hygienist
NIOSH - Boston, Massachusetts

cc:
R. Hartle
E. Spirer
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D. Paiva
HETA 92-168 (Closeout)

VIII. REFERENCES

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TABLE I

Indoor Air Quality Parameters
Department of Employment & Training
Providence, Rhode Island
June 30, July 1, 1992

HETA 92-168

Work Location	Carbon Dioxide (PPM)	Relative Humidity (%)	Temperature (Degrees F)	Occupancy on June 30 or July 1, 1992
		4th FLOOR		
Business Mgr. Off.	500	51.1	76	20 employees
Labor Mkt. Inform.	600	48.7	76	20 employees
Personnel Dept.	550	49.9	77	16 employees
Admin. Benefits	600	49.4	74	9 employees
Workforce 2000	700	50.8	74	7 employees
		3rd FLOOR		
Tax Dept.	600	47.7	77	26 employees
Admin. Placement	600	50.2	74	22 employees
Collection Dept.	450	51.2	73	13 employees
Status Unit	900	50.1	77	17 employees

Data Processing Prog.Area	600	44.0	72	24 employees
Data Processing Oper.Area	400	46.0	73	10 employees
		2nd FLOOR		
Mail Rm.	1,100	47.1	74	6 employees
T.D.I.	600	48.3	77	32 employees
Conversions Area	900	49.6	78	29 employees
Bd. of Review Area	600	45.3	79	13 employees
		1st FLOOR		
Job Service Recept.Area	1,000	45.2	73	7 employees 25 Gen.Publ.
Job Service Trging. Area	1,100	52.9	77	27 employees
Mass. Benef. Unit	800	45.1	75	15 employees
Providence Area Benef.	600	45.5	76	19 employees
Benefits Counter	900	42.2	72	25 employees 43 Gen. Publ.

Outside Air	200	58.8	83	N/A
2:00 PM 6/30/92				
3:30 PM 7/1/92	200	73.8	92	N/A

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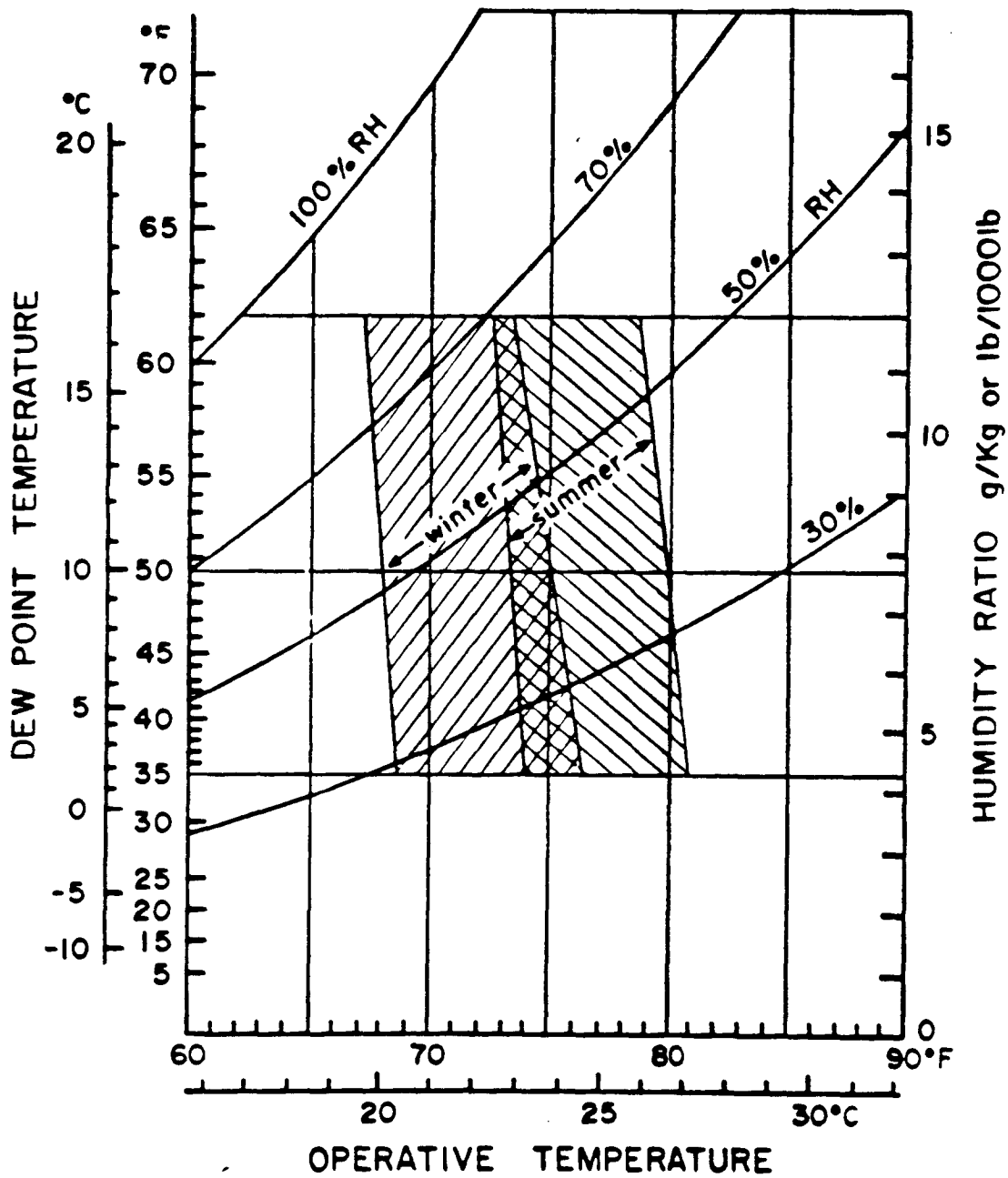
* 4th floor evaluation was conducted 6/30/92

* 3rd, 2nd and 1st floors were evaluated on 7/1/92
Evaluation Criteria: American Society of Heating, Refrigeration, and Air-Conditioning Engineers Standard 55-1981, Revised Standard 62-1989.

Figure 1.



Acceptable ranges of operative temperature and humidity for persons clothed in typical summer and winter clothing, at light, mainly sedentary, activity (≤ 1.2 met).