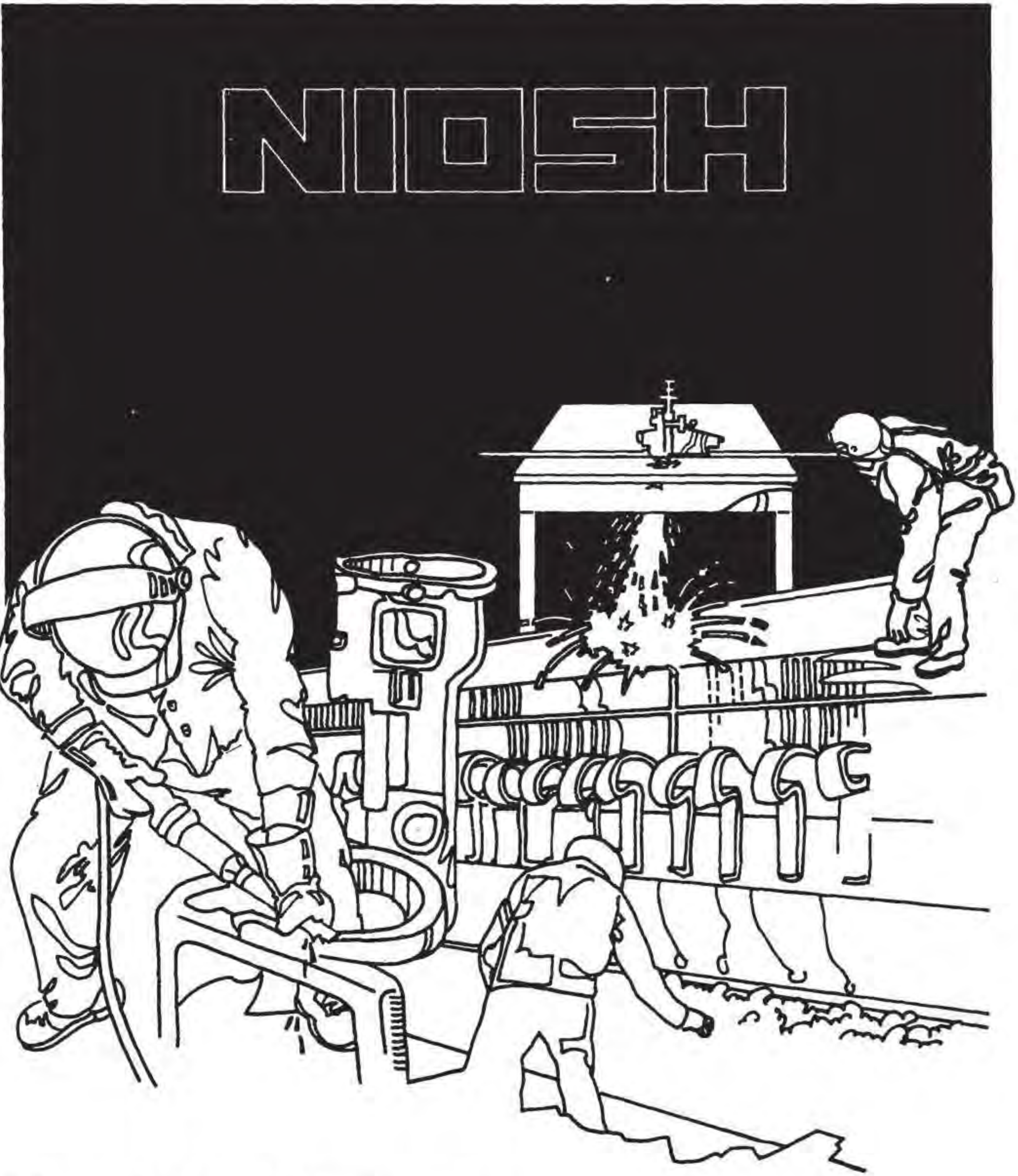
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health



Health Hazard Evaluation Report

HETA 81-314-1435
RUTGERS UNIVERSITY
NEWARK, NEW JERSEY

PREFACE

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

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

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I. SUMMARY

In May 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from Rutgers University, Newark, New Jersey to reevaluate working conditions and observe the implementation of recommended changes in Smith Hall after the building had undergone extensive renovations. NIOSH had conducted a previous evaluation of Smith Hall (July 1980) to determine whether exposures to chemical, physical and biological agents, including hormones, generated or used by operations in the Institute for Animal Behavior (IAB) located in the building, were linked to the reported abnormal incidence of cancer, breast cysts and ovarian cysts among employees. The results of the initial 1980 evaluation indicated no evidence of environmental overexposures as determined by a walk-through survey and review of available environmental monitoring data. However, deficiencies associated with water damage, ventilation and animal handling were noted and corrective measures recommended.

The reevaluation initial survey of Smith Hall was conducted on September 21-23, 1981 and included a walk-through survey of the building, a tracer gas study to determine air flow patterns, measurements of temperature and ventilation and air sampling to determine airborne concentrations of the hormone estradiol benzoate during a mixing procedure in the IAB. In addition a walk-through survey of the IAB was conducted on September 24, 1981 by a veterinarian. A follow-up study during which 45 air samples and 16 wipe samples for estradiol benzoate, progesterone, testosterone, B-estradiol, estrone and testosterone proprionate were collected was conducted on February 11-13, 1982.

The walk-through survey of Smith Hall indicated that most observable deficiencies had been corrected. Ventilation measurements revealed, in general, a balanced system. In addition, the results of the tracer gas study showed no migration of the tracer gas between floors nor recirculation of exhaust air. Temperature readings were all near the optimum comfort range.

Concentrations of estradiol benzoate measured on September 24, 1981 ranged from below the limit of quantitation to 1,070 ug/M^3. The highest concentration detected was in the mixing room in the IAB during a 10 minute mixing procedure. Concentrations on the first three floors ranged from 170-540 ug/M^3. (NIOSH recommends that substances, including estrogens, which are known to cause cancer in animals be maintained at the lowest feasible levels).

The follow-up air and wipe sampling conducted by NIOSH in February 1982, did not detect the presence of any hormones above the limits of detection.

As part of the follow-up evaluation, a careful review was made by NIOSH of all available hormone sampling data collected by Rutgers between 1980-1982. This data was much more extensive than that available during the 1980 initial evaluation. Review of this sampling data indicates positive air and wipe sample results for hormones in Smith Hall between 1980-1982 and that these measured hormone levels were greater than those of control buildings.

The results of the September, 1981 NIOSH evaluation indicate evidence of increased hormone concentrations in Smith Hall over control building levels.

However, data collected at the time of the follow-up survey in 1982, indicated that floors 1, 2, and 3 of Smith Hall were not significantly contaminated with hormones. Sampling results for floors 4 and 5 showed the need for further clean-up. All other noted deficiencies in the building appear to have been corrected. Recommendations are made in Section VIII of this report to ensure that hormone levels be maintained at background concentrations.

KEYWORDS: SIC 8221 Colleges, Universities and Professional Schools, hormones, estradiol benzoate, progesterone, testosterone, B-estradiol, estrone, testosterone proprionate.

II. INTRODUCTION

In May 1981, NIOSH received a request for technical assistance from Rutgers, the State University of New Jersey, to reevaluate conditions in Smith Hall on the Newark campus. In 1980, NIOSH conducted an evaluation at Smith Hall to determine if employees were being exposed to chemical, physical or biological agents for the Institute of Animal Behavior (IAB), located on the fourth and fifth floors of the building. These exposures were suspected of causing excess cancer, breast cysts and ovarian cysts in Smith Hall faculty and personnel. The original evaluation of Smith Hall included a walk-through survey, review of ventilation and plumbing problems, review of chemical and biological samples collected by Rutgers' personnel and a review of various procedures used in the building. Based on this review, NIOSH concluded that there was no reason to believe that excessive human exposure to estrogens was taking place and that levels of other chemical and biological substances would not cause occupationally-induced disease. Although no evidence of sustained environmental overexposures were found, recommendations were made to alleviate observed deficiencies in the building (Technical Assistance Report 80-092-769). These deficiencies were to be corrected as part of the extensive renovation of the building being conducted at the time. A reevaluation was then requested of NIOSH in May 1981 after the renovations in Smith Hall had been completed.

In response to this request, the following surveys were conducted: an initial environmental survey on September 21-23, 1981, a walk-through survey of the IAB by a veterinarian on September 24, 1981 and a follow-up environmental survey on February 11-13, 1982. The study also included a review of the report issued by Rutgers in August 1982 on Hormone Sampling and Analyses.

Interim reports were provided to Rutgers in October 1981, February 1982 and August 1982. This report will focus on summarizing NIOSH's environmental evaluations of the Smith Hall building. The New Jersey Department of Health has conducted an independent assessment of possible health compliants among employees working in Smith Hall.

III. BACKGROUND

Smith Hall is a five story building erected in 1968. Offices and classrooms of the Psychology Department are located on the first three floors and on part of the fourth floor. The remainder of the fourth and fifth floors are used for animal housing for the Institute of Animal Behavior. Animal experimentation with estrogens had been conducted on the fourth and fifth floors since 1968.

Renovations performed in the building dealt with water leakage problems and associated repairs from water damage and improvements in the ventilation and animal incineration facilities.

IV. EVALUATION DESIGN AND METHODS

A. Initial Survey

The initial survey conducted on September 21-23, 1981 began with a walk-through survey of the building to observe current conditions and the renovations which had been completed. The environmental evaluation on the initial survey consisted of three distinct phases: (1) a tracer gas study which used sulfur hexafluoride to determine whether there was any migration of gases from the Institute of Animal Behavior (IAB) located on the fourth and fifth floors to the third floor, (2) comfort ventilation and air movement measurements in various offices, laboratories and animal housing rooms in the building and (3) air sampling during the mixing of the hormone estradiol benzoate in the IAB.

1. Sulfur Hexafluoride Tracer Gas Study

Two separate experiments were conducted with the tracer gas: (1) the tracer gas was injected directly into the exhaust ventilation system for the IAB on the fourth floor and the gas detector (a gas chromatograph) was positioned in Room 356 to determine whether or not the tracer gas would migrate through the buildings' ventilation system, or be captured by the buildings' air intake system (located at ground level) for the first three floors of the building, and (2) the tracer gas was released in the laboratory in the IAB (Room 4-259) and the gas detector was located in the corridor of the third floor in front of Room 356 to determine if there was any potential for migration of gases through the floors or stairwells of the building. (More detail on the techniques used can be found in the complete text of the tracer gas report located in Appendix I).

2. Ventilation and Temperature Survey

Several rooms, laboratories and animal quarters were checked for relative comfort ventilation. A Kurz velometer was used to measure mean air velocities by taking four measurements in each room and determining the average for these measurements. Smoke tubes were used to determine whether the rooms were under negative pressure by releasing smoke at the gaps below the doors or at the edge of the door when it was slightly ajar.

A Bendix psychrometer was used to obtain dry bulb and wet bulb temperatures. The results of these measurements were used to calculate the effective temperature as defined by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

3. Air Sampling for Estradiol Benzoate

On September 22, 1981, air samples for estradiol benzoate were obtained during the weighing and mixing of that substance with a carrier fluid. The weighing and mixing of 5 mg of estradiol benzoate with 5 ml of ethanol was observed in Room 4-253a. The experimenter who mixed the materials wore disposable surgical gloves and disposed of the papers upon which the estradiol benzoate had been weighed, and the surgical gloves in a separate plastic bag. This weighing and mixing operation was completed within five minutes. (The solution produced was sufficient to dose 500-1,000 animals.) Ten air samples were collected on FALP filters at flow rates ranging from 3.0 to 13.9 liters per minute. Three air samples were collected in Room 4-253a, the other samples were collected in offices on the first, second, and third floors of Smith Hall. In addition, two air samples were collected and analyzed as controls from the NIOSH offices in the Federal Office Building in Cincinnati, Ohio.

At the laboratory, the filters were extracted with acetonitrile and analyzed by High Performance Liquid Chromatography (HPLC). Separation of the estradiol benzoate from solvent and sample interferences was achieved with a C_{18} Radial Compression column. Quantitation and detection utilized a UV detector monitoring at a wavelength of 201 nm, the absorbance maximum for estradiol benzoate. Chromatographic conditions were: A 15 minute isocratic run of 70% acetonitrile/30% water at 1 ml per minute.

A recovery study was made by spiking 89 ng, 445 ng, and 890 ng of estradiol benzoate and analysis by the described method. Analysis of the data gave a recovery of 100% with a sample relative standard deviation (RSD) of 5% at these levels.

A calibration curve was established from 50 ng to 1780 ng per filter. The RSD was less than 10% down to near 50 ng. The RSD increased to 20% at 50 ng per filter. Ten nanograms was determined to be the Limit of Quantitation. Not detected means that there was no electronic signal detected at the retention time of estradiol benzoate. As part of the quality assurance program, nine filters were spiked and analyzed with the samples. The ratio of analyzed versus calculated value average 106%. All samples were run in triplicate with good agreement in all cases.

B. Veterinarian Survey

On September 24, 1981 the Centers for Disease Control veterinarian conducted a walk-through survey of the IAB.

C. Follow-up Survey

It was determined based on the results of the hormone levels measured on the initial survey, that further environmental sampling for hormones was necessary. This sampling was conducted on February 11-13, 1982.

During the February 11-13, 1982 survey, NIOSH conducted air and wipe sampling in Smith Hall for estradiol benzoate, progesterone, testosterone, B-estradiol, estrone and testosterone proprionate. Forty-seven air samples were collected on FALP filters at flow rates ranging from 3.0 to 14.1 liters/minute. Sixteen wipe samples (each covering a surface area of 1/25 M^2) were collected on gauze aided by an isopropanol-water wetting agent. On the first three floors of the building, air samples were taken in all 4 corner rooms and in rooms along both hallways at about 1/3 and 2/3 of the way down the halls, making a total of 8 samples/floor. The samples for these three floors approximate vertical columns in the building and were intended to determine extent of contamination on the first three floors. Wipe samples were also taken in some of these rooms. Air and wipe samples in the Institute for Animal Behavior (fourth and fifth floors) were taken in rooms where hormones had been mixed or injected into animals. All samples were extracted with acetonitrite, concentrated and analyzed by HPLC. The limit of detection for the air samples was 10 ng/filter. The limit of detection for the wipe samples was 100 ng/sample.

In addition to the samples collected by NIOSH, 67 air, 210 wipe and 23 solid samples were collected by Rutgers University and the New Jersey State Department of Health between February 13, 1982 and April 19, 1982. Samples were collected in Smith Hall and Conklin Hall (a classroom building chosen as a control). Samples collected by Rutgers were analyzed by a radioimmunoassay technique.

V. EVALUATION CRITERIA

NIOSH does not currently have a recommended criteria for hormones. However, estrogens, as a class of substances, have been observed to cause cancer at numerous sites in several different animal species. For example, estradiol benzoate is known to cause lymphoma, thymus cysts and cervical carcinoma in mice.[1-4] Human data on the use of estrogens suggest that they induce cancer of the endothelium. It is believed that the induction of cancer by estrogens is related to their basic biological function; to stimulate cell division. It is NIOSH's recommendation that substances, including estrogens, which are known to cause cancer in animals be maintained at the lowest feasible (or detectable) levels.

VI. RESULTS

A. Walk-Through Evaluation

The walk-through evaluation was primarily concerned with assessing the implementation of recommendations which had been previously made by NIOSH. The problem of water leakage into the third and lower floors had been addressed by a complete waterproofing of the floors in the animal quarters of the IAB. The waterproofing extended four inches up the side walls and included a built-up dam at the entrance to each of the rooms which contains water in the rooms during normal wet cleaning operations. Cracks which had been observed near the drains in the monkey quarters had been repaired and covered with waterproofing materials. Roof leaks originating on the northeast side of the building, which were leading into the ventilation system have been located and repaired. Soiled ceiling tiles in office areas of the third floor had been removed and the ceilings had been repainted. Soiled ceiling tiles on the basement, first and second floors had been repainted.

The exhaust plenum from the animal quarters was modified in December 1980 to exhaust above the roof of the building. This modification was observed to eliminate the strong animal odor which was previously present at the plaza level of the building due to the prior configuration of the animal exhaust plenum which was located at the fourth floor level and directed exhaust flow in a downward manner.

Comfort ventilation on the third floor had been improved by extending the ductwork from the mixing boxes and adding diffusers to more evenly distribute the flow of air throughout each individual room. Diffusers had also been added in rooms on other floors to improve the circulation of air.

The use of chloroform to kill unwanted rodents which have been trapped in the building had been discontinued. The use of anticoagulant rodent tracking powders in the buildings' mechanical ventilation system had also been discontinued.

The animal incinerator had been upgraded to meet Newark emission standards and animal carcasses were now disposed of at the earliest possible date.

Eating or storing food or beverages was not observed in any of the laboratories in Smith Hall.

B. Sulfur Hexafluoride Tracer Gas Study

On September 22, sulfur hexafluoride was injected into the exhaust ventilation of Room 4-259 and samples in Room 356 on the third floor corridor. It was also injected into the exhaust ventilation system of Room 4-205 in the IAB and sampled for on the third floor corridor near Room 308. The gas chromatograph did not detect any sulfur hexafluoride in Room 356 or near Room 308 during the duration of the experiment. This was not surprising as the air intake for the ventilation systems for the lower levels of Smith Hall are located at the ground level on the west side of the building and, thus, was upwind of the exhaust plenums for the IAB which are located at the NE and SE corners of the roof. The National Weather Service at the Newark Airport reported winds from the S-SW at 9-10 mph and a temperature of 74 degrees F at 12:30 PM on this day.

On September 23, sulfur hexafluoride was released in Room 4-259 of the IAB. No sulfur hexafluoride was detected in the corridor on the third floor. On this day, the National Weather Service at Newark Airport reported winds from the NW at 20-35 mph, and a temperature of 54 degrees F at 8:30 AM.

Results of the tracer gas release into the IAB plenums did not detect any recirculation of exhaust air when the wind direction was from the NW. These results also indicated that there was no migration of the gas from the fourth floor release point to the detection site on the third floor.

The complete text of the tracer gas report is presented in Appendix 1.

C. Ventilation and Temperature Survey

1. Temperature

Effective temperature (ET) is defined as an arbitrary index which combines into a single value the effects of temperature, humidity, and air motion on the sensation of warmth or cold felt by the human body. The numerical value of the index for any given combination of conditions is the temperature of still, saturated air which would induce an identical feeling of warmth. Since no reliable objective measurement of comfort has been found, comfort studies have had to be based on the subjective reactions of trained subjects. The ASHRAE Comfort Chart is the result of such a study, and has been widely used to assess relative comfort. This chart, with effective temperatures plotted on dry- and wet-bulb coordinates is reproduced in Figure 1 with effective temperature lines shown dashed. The distribution curve in the upper part of this figure indicates that the maximum percentage of people should be comfortable in summer at 71 ET. Similarly, the partial distribution curve in the lower part of the figure indicates a maximum percentage of people comfortable in winter at 68 ET.

Measurements taken to determine effective temperatures in Smith Hall are presented in Table I. A review of the data will indicate that all of the effective temperatures measured were at, or below 71 degrees F. The measurements taken on September 22 were all near the optimum comfort range for summer values; measurements taken on September 23 indicated ET's which were several degrees cooler.

2. Ventilation

In general, offices should be under positive pressure and laboratories and animal quarters should be under negative pressure to control and prevent migration of contaminants. The animal quarters and offices on the fourth floor of Smith Hall are separated by double doors which provide a barrier to migration. Smoke tube measurements indicated that the ventilation was correctly balanced, that is, there was positive pressure on the office side of the double doors and negative pressure on the side where animals are quartered. However, as Table I indicates, several individual rooms were out of balance. Specifically, Rooms 4-211, 4-236, 4-214, and 4-141 were under positive rather than negative pressure. Offices in Rooms 326 and 305 were observed to be under negative rather than positive pressure.

During the ventilation survey, Rooms 135, 136, 137, 138, and 139 were observed to have an anomaly in their ventilation patterns. Smoke tube measurements indicated that fresh air was cascading through slots located at the wall-ceiling interface rather than through the diffusers which were centrally located in the ceiling. The diffusers were observed to actually be drawing air rather than supplying air. The Physical Plant personnel investigated this problem and determined that it was due to the accidental blowing open of gates on the ventilation mixing boxes in the dropped ceiling. These open gates allowed the supply of air to spill out of the mixing boxes and through the slots rather than passing through the diffusers. The gates were repaired by the physical plant personnel.

Finally, a Labconco portable fume hood in Room 4-211 was evaluated. The portable hood was equipped with a charcoal filter, after which the exhaust air passed through a flexible duct which was connected to a permanent exhaust vent located in the ceiling of the room. Face velocities on the hood were measured with a Kurz velometer. The average face velocity of the fume hood was 18 feet per minute. These hoods were observed in use with compounds ranging from formalin (used to fix tissue sections) to halothane (used to anesthetize mice). The NIOSH recommended guidelines for laboratory hoods used to control substances with exposure limits below 1 ppm or substances which are cancer suspect agents or carcinogens is 150 feet per minute as an average face velocity.[7]

D. Walk-through of the IAB

The findings of the follow-up veterinarian inspection of the IAB are presented in Appendix 2.

E. Survey for Estradiol Benzoate (September 1981)

The results of the analyses for estradiol benzoate for the September 24, 1981 survey are presented in Table 2. The concentrations ranged from below the limit of quantitation to 1,070 ng/M^3. The highest concentration was detected on a 10 minute sample taken in Room 4-223a during the mixing of estradiol benzoate. The next highest levels were detected on the third floor of Smith Hall (3 out of 4 rooms sampled). The lowest detectable level was measured on the first floor.

F. Survey for Hormones (February 1982)

Follow-up sampling by NIOSH for estradiol benzoate, progesterone, testosterone, B-estradiol, estrone and testosterone proprionate in February 1982 revealed no hormone levels above the limits of detection of the method used. The limit of detection for the air samples was 10 ng/filter and for the wipe samples, 100 ng per sample.

G. NIOSH Review of Previous Sampling Data

Data collected by Rutgers (labelled as Feder Air Sample Data) for 17B estradiol during May and June 1980 is presented in Tables 3 and 4. Table 3 is the data table originally provided to NIOSH and includes results of 17 air samples from Smith Hall, 2 from a control building (Doolittle) and one blank filter. Table 4 is the same data presented in Rutgers final report on Smith Hall. This table does not contain 3 of the air sample results (Number 18, 22, and 24) presented in Table 3. The questions in reviewing these data are if 17B estradiol hormone levels were present in Smith Hall and if levels were greater than those in the control building.

The data presented in Table 4 shows that the absolute nanogram per filter values for 17B estradiol in Smith Hall ranged from less than the minimum detectable limit (MDL) of 0.010 ng/filter to 0.400 ng/filter. The two control building (Doolittle) absolute nanogram filter values were 0.780 and 0.768. The blank filter value was reported to be 0.272 nanograms.

A review of the data indicates that only one blank filter was analyzed and that the blank value reported (0.272 ng) was greater than all but 2 of the 14 reported air sample results from Smith Hall. The mean value for the 12 samples below the blank filter value was 0.113 ng with two of the values being reported at the MDL of the analytical method (0.01 ng). Thus the data would indicate that it is impossible to have an average blank contribution of 0.272 ng per sample. The data also indicates, as does good analytical methodology, that the analyses of only one blank is insufficient and that in this set, the blank value reported was in error. As a result, it is impossible to blank correct this set of data. However, for the data to be valid, the assumption must be made that the relative contribution to the reported concentrations due to media and laboratory procedures (referred to by Rutgers as procedural interference) is equal for all samples analyzed. Thus, assuming equal procedural interference for the Smith Hall and control samples, a comparison between the two sets can be made using the absolute filter values to calculate air concentrations.

The air concentrations calculated by using the absolute nanogram per filter values are presented in the last column on Table 4. Air concentrations for 17B estradiol in Smith Hall ranged from below the limit of detection to 9.63 ng/M^3. The two control building values were 0.135 ng/M^3 and 0.133 ng/M^3. Using a two-sample t-test with an adjustment for unequal variances, the mean air concentration of 17B estradiol for Smith Hall ($\overline{X}$ = 1.90 ng/M^3) was found to be significantly (p - .023) greater than the mean concentration for Doolittle Hall ($\overline{X}$ = 0.134 ng/M^3). Since the sample blank value applies to the data of both buildings, the two-sample t-test results are not influenced by the blank value. Thus the data indicates that 17B estradiol was present in Smith Hall and the differences between the levels in Smith Hall and the control building were statistically significant.

VII. DISCUSSION

The level of hormones present in Smith Hall, particularly between 1980-1982, is a complex and controversial question. At the time of our initial involvement, there was considerable concern about an excess incidence of cancer, breast cysts, and ovarian cysts among Smith Hall faculty and personnel. This was investigated by the New Jersey Department of Health. The building had numerous deficiencies associated with water damage, ventilation, and animal handling which required correction. Moreover, during the period of the NIOSH evaluation, many of these deficiencies were being corrected.

The statistical analysis of the hormone concentrations found by the various environmental studies has not been consistent. For example, the Rutger analyses of the 1980 sample set (see Section VI G above) stated that the appropriate approach to comparing the data requires that the concentrations be adjusted for both volume of air sampled and interference effects. It was stated that it was not appropriate to simply divide the filter value by its associated volume of air to determine concentrations because there are interferences in measurements that allow blanks to assume non-zero absolute values. As a result, all values were corrected for background and procedural interferences before any comparisons between Smith Hall and the control building results were attempted.

All values were first adjusted for background. The blank value (0.272) was subtracted from the control building absolute nanogram filter value of 0.780. The control value had an associated volume of 5.76 M^3. Following this reasoning, background for any sample could be determined by simply volume adjusting the .51 ng background value. For a sample with a volume of 0.5 M^3, the background contribution was considered $\frac{0.5 M^3}{5.76 M^3}$ x .51 ng or 0.044 ng. This calculation was performed for each sample and is presented in Table 4 as "Adjusted S Scores". The adjusted S scores are considered to represent procedural interferences and/or hormone levels. The blank value of 0.272 ng was then considered to be the procedural interference for this data set.

A review of the adjusted S scores in Table 4 show that the 14 air sample values for Smith Hall range from 0 to 0.35640 ng. The 12 values below 0.272 ng were therefore considered to be due strictly to procedural interferences. The 2 values above 0.272 were considered to be within the typical range of deviation due solely to procedural interferences. As a result, almost exclusively based on the one blank value of 0.272, Rutgers conclusion was no 17B estradiol levels were measured in Smith Hall above those which could be attributed to chance variation from procedural interferences and background. (The complete write-up of the Rutgers evaluation of this data set can be found in their final report.)

This example clearly points out the differences in interpretation of data. NIOSH's reviewing of the data set indicated levels of 17B estradiol in Smith Hall and levels which were found to be significantly higher than those in the control building. Rutgers' analyses of the same data indicated no evidence of 17B estradiol. A complete dicussion on the interpretation of each data set collected in Smith Hall and the various control buildings between 1980-1982 is beyond the scope of this report. However, the following is a summary of the NIOSH interpretation of the available data:

1. The Feder Data from 1980 showed levels of 17B estradiol in Smith Hall above those in the control building.

2. Numerous data sets were collected and analyzed by Emory between 1980-1981. The evaluation, interpretation and comparison of Smith Hall versus control building results is extremely difficult due to the numerous sets of data collected on different dates and the limited and highly variable blank values available for normalizing the data.

3. Results of the NIOSH air sampling on September 22, 1981, indicated 5 out of 7 rooms sampled in Smith Hall had airborne levels of estradiol benzoate. The highest concentration was detected on a 10 minute sample adjacent to a mixing procedure involving estradiol benzoate. No detectable levels were found on the control building

samples. The analytical procedure used was specific for the compound, no interferences were present, sufficient numbers of blanks were provided and analyzed and laboratory spiked samples indicated excellent recovery and specificity.

4. Follow-up air and wipe sampling for estradiol benzoate, progesterone, testosterone, B-estradiol, estrone and testosterone proprionate conducted by NIOSH on February 11-13, 1982 did not detect the presence of hormones above the limits of detection of the analytical method.

5. Samples collected by Rutgers and the New Jersey State Department of Health between February and April 1982, indicated positive sample results for hormones. Wipe sample results showed hormone levels in Smith Hall greater than those of the control buildings, especially on the fourth and fifth floors.

There is no reason to expect that levels of hormones found in Smith Hall exist in a steady state or would remain the same over any given period of time. In the same sense, the concentration of a hormone in a room would not necessarily be assumed to be uniform at any given time. Where sampling techniques are used to measure nanogram levels of substances, even small amounts present for short time periods can be detected.

When considering the time period from 1980-1982, the conditions in Smith Hall changed dramatically. The building had undergone extensive renovations and then clean-up procedures. The first NIOSH survey for this report was conducted just after massive renovations were completed. The last survey conducted by NIOSH did not detect any levels of hormones above the limits of detection. This may reflect the improved conditions brought about by the renovation and the progressive cleanup thereafter. The improved ventilation and general work conditions and practices used in the building would also be expected to prevent possible build-up and distribution of hormones.

In conclusion, after evaluating all available data, it appears that hormone levels in Smith Hall have been at higher levels than non-Smith Hall locations. The concentrations measured during the 1982 evaluation indicate hormone levels around background concentrations on floors 1-3 of Smith Hall. The results also indicate areas and surfaces on the fourth and fifth floor where hormone concentrations are above those considered as background.

VIII. RECOMMENDATIONS

Based on these results, NIOSH recommended in our August, 1982 Interim report that the building be reopened with the following qualifications. Some of these recommendations may no longer be applicable due to subsequent changes.

1. Access to the 4th and 5th floors of Smith Hall should be limited to need.

2. The mixing and handling of hormones should be conducted under strict guidelines and adequate laboratory ventilation.

3. Continuous clean-up procedures should be followed wherever hormones are handled to eliminate any build-up of these materials.

4. Maintain a periodic monitoring program in the building to ensure that hormone levels continue to be maintained at background concentrations.

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service

(NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Rutgers University
2. NIOSH, Region II
3. OSHA, Region II

Table 1

Comfort Ventilation in Smith Hall

Rutgers University
Newark, New Jersey
HETA 81-314
September 22-23, 1981

Room Number	Type of Room	Date of Measurement	Dry Bulb Temperature °F	Mean Wet Bulb Temperature °F	Air Velocity (Feet Per Minute)	ASHRAE Effective Temperature (°F)	Pressure in Room Relative to Corridor
352	Office	9-22-81	71	62	12	68	+
356	Office	9-22-81	73	64	8	70	+
4-259	Laboratory	9-22-81	72	68	8	71	-
4-259a	Laboratory	9-22-81	72	68	8	71	-
204	Office	9-22-81	69	61	24	66	+
135	Office	9-22-81	76	64	5	71	+
4-211	Laboratory	9-22-81	72	63	10	68	+*
4-305	Research Room	9-22-81	72	65	7	69	+
4-236	Ring Dove Quarters	9-22-81	74	65	60	70	+*
4-214	Mice Quarters	9-22-81	73	65	5	70	+*
4-229	Ring Dove Quarters	9-22-81	74	65	5	70	-
4-141	Mice Quarters	9-22-81	74	65	13	70	+*
126	Academic Foundation	9-23-81	67	5	17	62	+
109	Laboratory	9-23-81	69	52	17	64	-
103	Classroom	9-23-81	68	56	25	64	+
4-310	Laboratory	9-23-81	72	57	3	67	-
326	Office	9-23-81	69	57	13	65	-
319	Office	9-23-81	69	57	14	65	+
305	Office	9-23-81	70	57	5	65	-*

* Indicates ventilation imbalance

Table 2

Air Sampling For Estradiol Benzoate

Rutgers University
Newark, New Jersey
HETA 81-314
September 22, 1981

Location	Sample #	Time	Volume (1)	Concentration ng/M3
Room 4-223a	1	1131-1141	90	1070
Room 4-223a	2	1131-1141	90	BLQ*
Room 4-223a	3	1131-1141	30	BLQ
Room 363	4	1056-1809	1,299	540
Room 303	5	1059-1803	1,272	350
Room 332	6	1105-1808	1,269	170
Room 356	7	1051-1810	6,102	BLQ
Room 356	8	1051-1810	6,102	BLQ
Room 204	9	1110-1756	1,218	BLQ
Room 135	10	1115-1736	1,143	230
Blank	11	-	-	BLQ
Blank	12	-	-	BLQ
Control Samples Federal Office Bldg. Cincinnati, Ohio September 24, 1981				
Room 9023	13	1034-1208	1,306	BLQ
Room 9023	14	1034-1208	1,306	BLQ

* BLQ - Below limit of Quantitation (10 ng/filter)

Table 3

Hazards Analysis - Smith Hall
Estradiol

Rutgers University
Newark, New Jersey
HETA 81-314

Date	Sample Number	Location	Concentrations Picograms[1]/ filter	Concentrations Nanograms[2]/ M3
5-6-80	1	Near elevator, 2nd floor	260*	5.0
5-6-80	2	Foyer near Auditorium, 2nd Floor	168*	0.3
5-6-80	3	Auditorium, 2nd Floor	400*	0.8
5-6-80	4	Room 358	<MDL**	-
5-6-80	5	Room 355	136*	2.9
5-6-80	6	Hall corridor outside Room 357	88*	0.2
5-6-80	7	Hall corridor near elevator, 3rd Floor	38*	0.1
5-6-80	8	Hall corridor outside Room 322	118*	0.3
5-6-80	9	Hall corridor outside Room 336	366*	9.6
5-6-80	10	Blank	272*	-
5-7-80	18	Room 4-252	266*	6.3
5-7-80	20	Room 4-143 (Cat)	254*	6.2
5-7-80	22	Room 4-210	264*	6.6
5-7-80	24	Room 4-308	398*	10.4
5-7-80	26	Room 4-106	191*	0.5
5-8-80	50	Exhaust duct Room 4-203	<MDL**	-
5-8-80	51	Supply duct Room 4-232	49*	0.2
5-8-80	52	Exhaust duct Room 4-260	57*	0.2
6-3-80	98	Doolittle Bldg. Room 139	780	0.1
6-3-80	99	Doolittle Bldg. Room 145	768	0.1

1 Picogram = 10^{-12} grams
2 Nanogram = 10^{-9} grams M^3 = Cubic meter
* Filters were split
** Minimum detectable limits

Table 4

Hormone Analysis (Naus)
Adjusted Scores for Feder 1980 Air Samples
For 17B Estradiol

Rutgers University
Newark, New Jersey
HETA 81-314

Floor	Location	Sample Number	Date	Analyzed By	Sample Type W=Wipe A=Air	Analyzed For	Nanograms per Filter Absolute	Air Sample Total Vol. M^3	Air Sample Adjusted S Scores	Air Concentration Absolute (ng/M^3)
Smith Hall, Bldg. 7223, Newark										
3	Hall near Elevator	7	5-6-80	Feder	A	17B Estradiol	0.038	0.400	.00312	.095
3	Hall by Rm. 322	8	5-6-80	Feder	A	17B Estradiol	0.118	0.402	.08295	.294
3	Hall by Rm. 336	9	5-6-80	Feder	A	17B Estradiol	0.366	0.038	.36269	9.63
3	Room 355	5	5-6-80	Feder	A	17B Estradiol	0.136	0.047	.13190	2.89
3	Hall by Rm. 357	6	5-6-60	Feder	A	17B Estradiol	0.088	0.428	.05068	.206
3	Room 358	4	5-6-80	Feder	A	17B Estradiol	<MDL	0.050	.00564	N.D.
2	Hall near Elevator	1	5-6-80	Feder	A	17B Estradiol	0.260	0.052	.25547	5.00
2	Hall Foyer Near Auditorium	2	5-6-80	Feder	A	17B Estradiol	0.168	0.520	.12266	.323
2	Auditorium	3	5-6-80	Feder	A	17B Estradiol	0.400	0.500	.35640	.800
4	Room 4-106	26	5-7-80	Feder	A	17B Estradiol	0.191	0.360	.15961	.531
4	Room 4-143 (Cat)	20	5-7-80	Feder	A	17B Estradiol	0.254	0.040	.25051	6.35
4	Room 4-203 Exhaust Duct	50	5-8-80	Feder	A	17B Estradiol	<MDL	0.286	0	.035

(Continued)

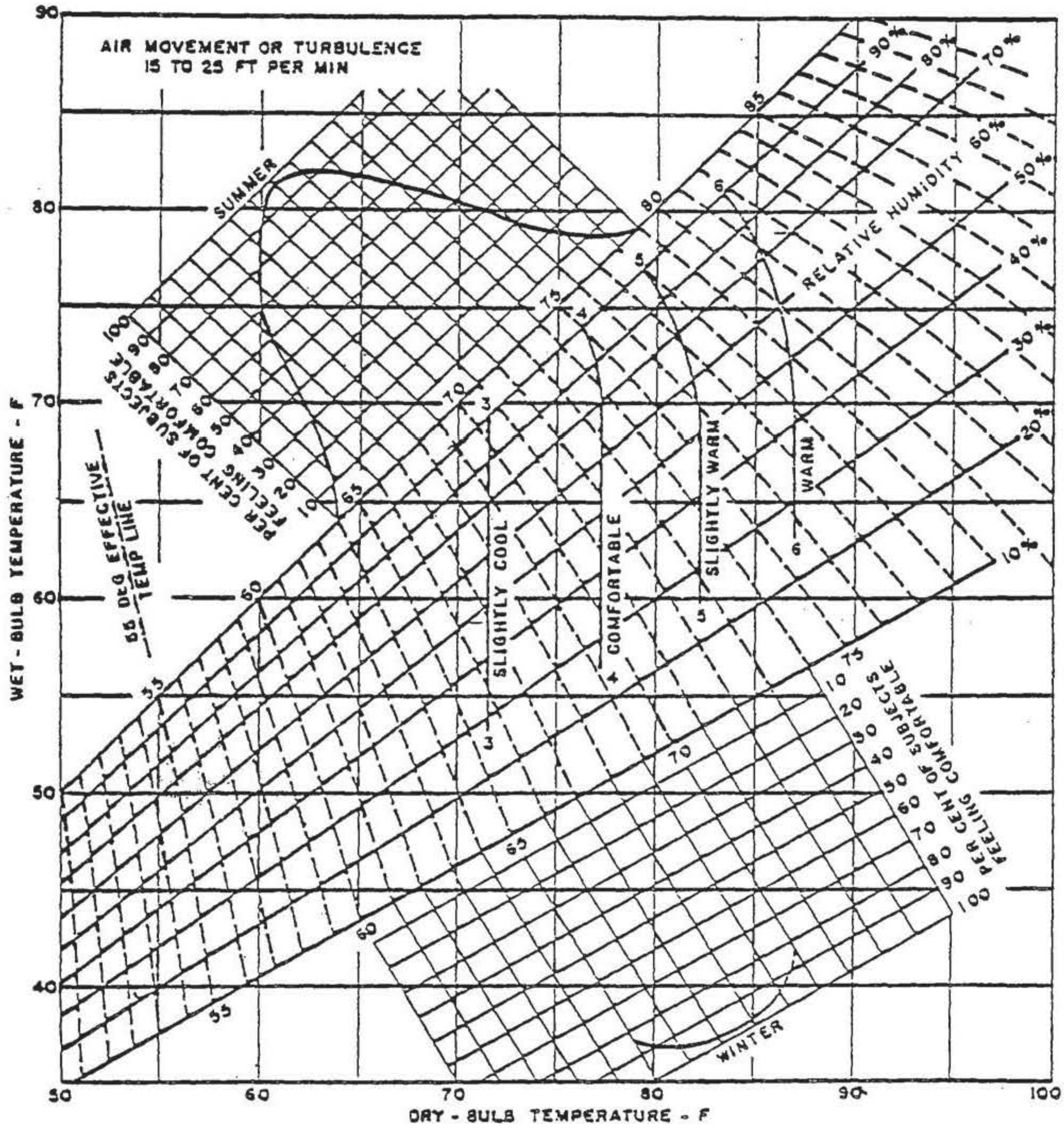
Table 4
(Continued)

Floor	Location	Sample Number	Date	Analyzed By	Sample Type W=Wipe A=Air	Analyzed For	Nanograms per Filter Absolute	Air Sample Total Vol. M^3	Air Sample Adjusted S Scores	Air Concentration Absolute (ng/M^3)
Smith Hall, Bldg. 7223, Newark										
4	Room 4-232 Supply Duct	51	5-8-80	Feder	A	17B Estradiol	0.049	0.274	.02511	.179
4	Room 4-260 Exhaust Duct	52	5-8-80	Feder	A	17B Estradiol	0.057	0.274	.03311	.208
Doolittle Bldg. 3572, Busch Campus										
1	Room 139	98	6-3-80	Feder	A	17B Estradiol	0.780	5.760	.27773	.135
1	Room 145	99	6-3-80	Feder	A	17B Estradiol	0.768	5.760	.26572	.133

MDL = Minimum Detectable Limit = .010 ng

FIGURE 1

Revised ASHRAE Comfort Chart
Rutgers University
HETA 81-314



APPENDIX 1

TRACER GAS INVESTIGATION REPORT

SMITH HALL
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY
CONDUCTED ON SEPTEMBER 21-23, 1981

Vladimir Hampl
Control Research Section
Monitoring and Control Research Branch
Division of Physical Sciences and Engineering

SUMMARY AND CONCLUSIONS

The tracer technique was used to identify the potential migration of the emission from the laboratory section of the Institute of Animal Behavior (IAB) into the area of the Psychology Department, located on lower floors of the Smith Hall. The sulfur hexafluoride (SF_6) was used as a tracer and the gas chromatograph as a detection device. The ventilation rate was evaluated by the tracer decay rate method. During the experiment, no SF_6 was detected in the area under investigation. The obtained results suggest that:

- There may be no migration of emission from the IAB laboratory section ventilation system into the building lower levels through the 1-3rd ventilation system or through down wind wall openings under the weather conditions existing during the experiment.

- There may be no migration of the emission from the IAB-laboratory section area into the third floor area via hall, door or stairwell connecting both floors.

The ventilation rate, found in Room #356 was 2.5/hour, which complies with the New Jersey State Uniform Construction Code (1981).

INTRODUCTION

On September 21-23, 1981, NIOSH-DPSE conducted tracer gas measurements in Smith Hall at Rutgers, the State University of New Jersey. Smith Hall is located on the Newark campus (see Figure 1). The measurements were requested and performed in cooperation with NIOSH-DSHEFS. The goal of the experiments was to determine a potential migration of gaseous emission from the laboratory section of the Institute of Animal Behavior (IAB), situated on the fourth floor, to the Department of Psychology, located on lower levels of Smith Hall.

Smith Hall Ventilation Systems

The five story Smith Hall has four separate and independent ventilation systems:

1) Serving floor one, two, three with an intake and exhaust adjacent to the building at underground level. Both intake and exhaust are located adjacent to each other in a moat.

2) Serving offices of IAB on the fourth floor, having intake and exhaust on the fourth floor at the end of the building.

3) Serving laboratories and animal quarters of IAB. The intake and exhaust are located on northern and southern side of the roof.

4) Serving the fifth floor having intake and exhaust on the roof.

Measurement technique and equipment

A tracer gas was used to determine if emissions from the IAB were migrating to the lower floors. A 100% pure sulfur hexafluoride (SF_6) was used as a tracer. It is non toxic gas, chemically inert, thermally stable and it does not generally occur in the ambient air. It is also easily detectable by an electron capture detector (ECD) at very low concentration. The lowest detectable limit is $\simeq$ 0.001 ppb. A Baseline Industries Inc. gas chromatograph, Model 1030A was used for the detection of SF_6. The instrument incorporated a built-in microprocessor enabling a continuous sampling. The chromatographic peaks were recorded on an external strip recorder. The sampler consisted of a filter holder connected to the small vacuum pump, which pulled the sampled air through the gas chromatograph. The sampling was repeated in 5 minutes intervals. Before each experiment, samples were taken to check whether the air sample contained detectable levels of SF_6 gas from previous measurements or another compound, which may interfere with SF_6 detection.

Procedure:

Two separate experiments were conducted:

1. To determine a possible contamination of the third floor area by the gaseous emission from the IAB-laboratory section ventilation system through the 1-3rd floor ventilation system. The measurements were performed in the northern and southern section of the building. In the norther part, SF_6 was discharged into ventilation exhaust of room #4-259 (IAB-laboratory room) and sampled in room #356 on the third floor. In the southern part, SF_6 was discharged into the ventilation system of room #4-205 (IAB - dove stock) and sampled on the third floor corridor, near the room #308. In both cases, SF_6 was released in amount of 10 l/min for 30 minutes and sampled for approximately one hour. The detection measurement started at the beginning of the gas discharge. Then, the measurements were repeated with increased SF_6 release flow rate of 20 l/min. This experiment was accomplished on September 22, 1981. On this day, the National Weather Service at Newark airport reported winds from the southwest at approximately 10 mph and temperature of 76° F at 12:30 P.M.

2. To determine any potential migration of gaseous emission from IAB-laboratory section to the third floor area through the floors or stairwell. In this case, the SF_6 was released into free space of room #4-259 and sampled on the third floor corridor in front of room #356 (close to the stairwell hall door). The SF_6 was first released in the amount of 1 l/min for 5 minutes; 35 minutes later, it was discharged in the amount of 0.5 l/min for 30 minutes. The sampling started at the first gas discharge and continued for 3 hours. During the experiment, the room #259 was completely open, the stairwell door was closed. This experiment was accomplished on September 23, 1981.

In addition, a small amount of SF_6 gas was released and sampled for in room #356 to determine a ventilation rate in this area.

Results and Discussion.

The experiments, conducted on September 22, 1981, showed no detection of SF_6. The chromatographic peak heights, obtained after the SF_6 release, were comparable with those obtained for air samples without the SF_6 discharge. Since the peaks were obtained at the highest sensitivity of the electron capture detector, the peak heights corresponded to the SF_6 concentration ranging in thousandths of ppb. This is close to the limits of SF_6 detection by ECD and to the background of SF_6 present in the air. The obtained peaks may also indicate an unknown compound present in the ambient air. The obtained results showed that migration of SF_6 into the third floor area via the 1-3rd floor ventilation system did not occur during the measurements. This may suggest that gaseous emission from IAB-laboratory section may not migrate into the building lower levels through the 1-3rd floor ventilation system under wind direction present on that day.

As mentioned above, the prevailing wind direction was southwest during the experiment. Under these conditions, air flow around the building could be schematically representative of the air flow pattern presented by HALITSKY (1963) and shown in Figure 2. The primary flow, approaching the vertical leading edge, splits and moves horizontally along the upwind walls. Near the top, the flow curles over the roof edges, but re-attaching almost immediately to the roof and proceeding downwind at high velocity. The primary cavity lies mostly downwind of the two downwind walls but a portion covers the lateral corner of the roof. The secondary flow approaching the downwind vertical building edge splits and moves upward and toward the lateral edges of the walls. Thus, the flow on the upwind walls is principally downwind, high speed and horizontal; the flow on the downwind walls is principally upwind low speed and with a marked upward component near the roof. The flow on the roof is downwind, high speed near the center and cavity flow near the corner.

The air intake of the Smith Hall 1-3rd floor ventilation system is located at the ground level of the upwind wall. Therefore, under the existing weather conditions,it seems to be highly unlikely that the SF_6 or emission released at the downwind side of the roof, would intrude into this ventilation intake area.

However, due to the downwind wakes, the emission may intrude into the building lower level area through openings in the downwind walls. Based on equations for evaluation of concentration in distorted flow fields, derived by HALITSKY (1962;1963), the SF_6 concentration around the downwind walls at the maximum dilution should be in a range of 20 and 40 ppb at the SF_6 discharge flow rate of 10 l/min and 20 l/min respectively. The equations derived by HALITSKY are justified for a typical air flow around the building and may not yield a precise concentration evaluation due to the different experimental conditions. But even a 100-fold higher dilution, than calculated, should yield the SF_6 concentration in the range of tenths of ppb, which was not found during the measurements. This may be an indication that the intrusion of the emissions from the IAB-laboratory section ventilation system into the building lower level area through the downwind wall opening did not occur.

The investigation of the potential intrusion of gaseous emissions into the third floor area through stairwell was completed on September 23, 1981. The peak heights, obtained before and during the SF_6 release, were again comparable showing no SF_6 present in the third floor corridor. This may be the indication that the emission from the IAB laboratory section did not migrate into the third floor area through the hall and stairwell connecting both floors.

The ventilation rate, evaluated in room #356 by determining the tracer gas decay rate, was found to be 2.5/hour. This is in compliance with the New Jersey Building Code, which requires the ventilation rate = 2/hours as minimum fresh air supply for the offices.

REFERENCES

Halitsky, J., 1962: Diffusion of Vented Gas Around Buildings. J. Air Poll Control Assoc., 12, 74-80.

Halitsky J., 1963: Gas Diffusion Near Buildings. Trans ASHRAE, 69, 464-84.

Lagus, P.L., 1980: Air Leakage Measurements by the Tracer Dilution Method, page 36-49. Published in: Building Air Change Rate and Infiltration Measurements; Hunt et al, Editors. ASTM. Philadelphia, PA.

New Jersey State Uniform Construction Code, BOCA, Basic Building Code, 1981.

Appendix A

Calculation of SF_6 concentration downwind around the Smith-Hall Building.

The equations, derived by HALITSKY (1963) for the SF_6 concentration evaluation around downwind building walls, were used, as follows:

$$C_w = K \frac{Q}{AV} \qquad (1)$$

where: C_w = concentration of SF_6

Q = SF_6 discharge flow rate, ft^3/min

V = wind velocity, ft/min

A = characteristic building area, ft^2

K = concentration distribution function

The gas concentration, C_w will decrease downwind as the wake grows in size and it will increase as the source is approached, reaching a maximum C_e in the duct:

$$C_e = \frac{Q}{A_e \quad V_e} \qquad (2)$$

where: C_e = concentration of SF_6 in the duct

A_e = duct area, ft^2

V_e = duct velocity, ft/min

The maximum value of K for the region outside the building is found by substituting C_e for C_w in Equation (1), yielding:

$$K = \frac{AV}{A_e \quad V_e} \qquad (3)$$

The diffusive power of the atmosphere in terms of the reduction in concentration between the exhaust opening and any given point in the field around the building could be expressed by the quantity called the dilution D.

Then: $$D = \frac{C_e}{C_w} = \frac{K_e}{K} \qquad (4)$$

Since roof exhausts generally produce values of K at the ground (or around the walls) of the order of unity, the dilution from roof to ground is of the order of K_e

In this case:

$$A \cong 18{,}020 \text{ ft}^2$$

$$Q = 0.35 \text{ ft}^3 \ (10/\text{min})$$

$$A_e = 3.14 \text{ ft}^2 \ (\text{duct diameter} = 2 \text{ ft})$$

$$V_e = 4035 \text{ ft/min (based on average flowrate} = 12{,}670 \text{ ft}^3/\text{min of } 13{,}440 \text{ ft}^3/\text{min and } 11{,}890 \text{ ft}^3/\text{min)}$$

$$V = 880 \text{ ft/min (10 mph)}$$

Then, $$D = \frac{AV}{A_e \ V_e} = \frac{18020 \times 880}{3.14 \times 4035} = 1251$$

and $$C_w = C_e/D = \frac{0.35 \times 1 \times 10^9}{1251 \times 3.14 \times 4035} = 22 \text{ ppb}$$

The dilution D may also be expressed as a function of distance from the exhaust (HALITSKY, 1962; 1963) yielding.

$$D = \frac{C_e}{C_w} = \left[\alpha + 0.11 \ s \ (1 + \frac{\alpha}{5}\right]^2 \qquad (5)$$

where α = function of building configuration = 20 for high dilution

$$s = \sqrt{\frac{S}{A_e}}$$

where S = shortest air distance between center of exhaust and point of interest.

<u>In this case:</u>

Assuming exhaust length = 15 ft and height of each floor = 20 ft

$$s = 31 \text{ ft}$$

Then $$D \text{ max dilution} = \left[20 + 0.11 \times 31 \ (1 + \frac{20}{5})\right]^2 = 1372$$

and $$Cw = \frac{C_e}{D \text{ max. dilution}} = 20 \text{ ppb } (SF_6 \text{ flow rate of } 10 \text{ l/min})$$

The SF_6 concentration will double at SF_6 flow rate of 20 l/min

Evaluation of Ventilation Rate

The ventilation rate was calculated from the logarithmic decay rate in tracer gas concentration with respect to time (LAGUS, 1980):

$$I = \frac{1}{t} \ln \frac{c_o}{c} \qquad (6)$$

where I = ventilation rate, $hour^{-1}$
t = time, hour
c_o = concentration of tracer gas at time = 0
c = concentration of tracer gas at given time

By plotting the natural logaritmus of the SF_6 concentration (linear scale) against time (linear scale) the measurements should fall on a straight line with time providing, the air exchange rate remains constant. The measured date of the SF_6 concentration shown in Table 1 were plotted versus time, as shown in Figure 3. The best fit straight line was calculated by least square method and resulted in:

$$c = e^{(0.565 - 0.042\, t)} \qquad (7)$$

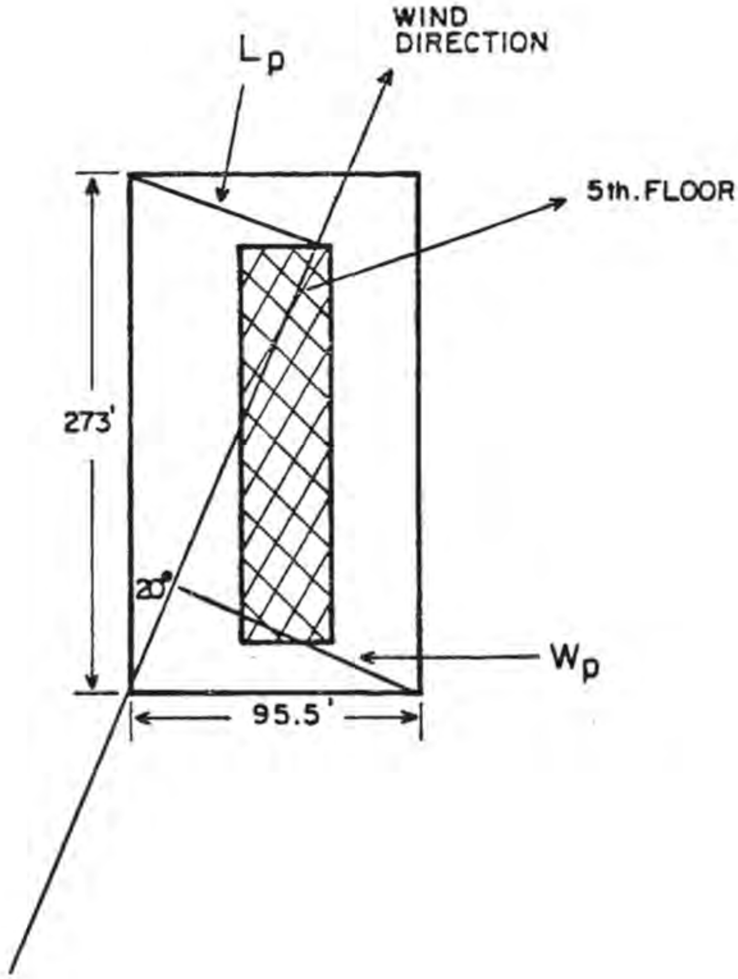
Then, the ventilation rate I was given by the difference of natural logaritmus of the SF_6 concentration at 60 minutes and 0 minutes. From Figure 3 and Equation (7), the ventilation rate I yielded 2.5/hour.

TABLE 1

Ventilation Rate Measurements.
Concentration of SF_6 [ppb]

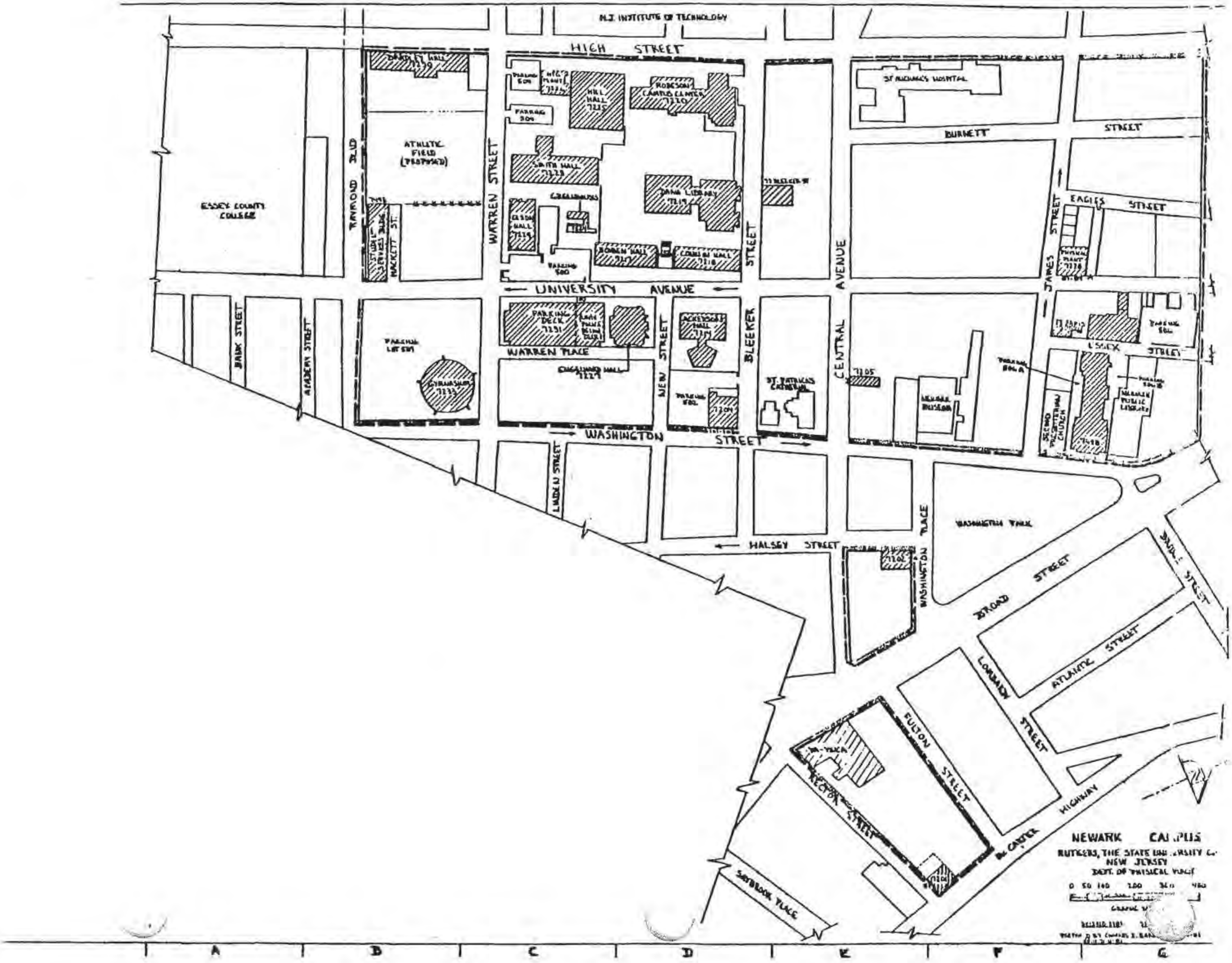
SF_6 Concentration [ppb]	Time [Min]
1.9	5
1.4	10
1.2	15
0.67	20
0.52	25
0.38	30
0.38	35
0.32	40
0.25	45
0.20	50
0.16	55
0.11	60
0.10	65
0.095	70
0.08	75
0.07	80
0.06	85
0.046	90

Estimation of Projected Building Area A



SMITH HALL building dimensions:	Length	= 272.5 ft
	Width	= 95.5 ft
	Height	= 83.5 ft
Projected width with regard to wind direction	L_p	= 272.5 x sin 20° = 93.2 ft
Projected width with regard	W_p	= 95.5 x sin 20° = 89.7 ft
Approximate height		= 15 ft
Approximate total height		= 98.5 ft
Approximate projected building area		= 18.020 ft^2

FIGURE 1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BURNETT STREET
ATHLETIC FIELD (PROPOSED)
ESSEX COUNTY COLLEGE
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JAMES STREET
EAGLES STREET
ESSEX STREET
UNIVERSITY AVENUE
WARREN PLACE
PARKING DECK
NEW STREET
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NEWARK MUSEUM
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WASHINGTON STREET
LINDEN STREET
BANK STREET
ACADEMY STREET
HACKETT ST.
HALSEY STREET
WASHINGTON PLACE
WASHINGTON PARK
BROAD STREET
ATLANTIC STREET
LOMBARDY STREET
FULTON STREET
RECTOR STREET
SAYBROOK PLACE
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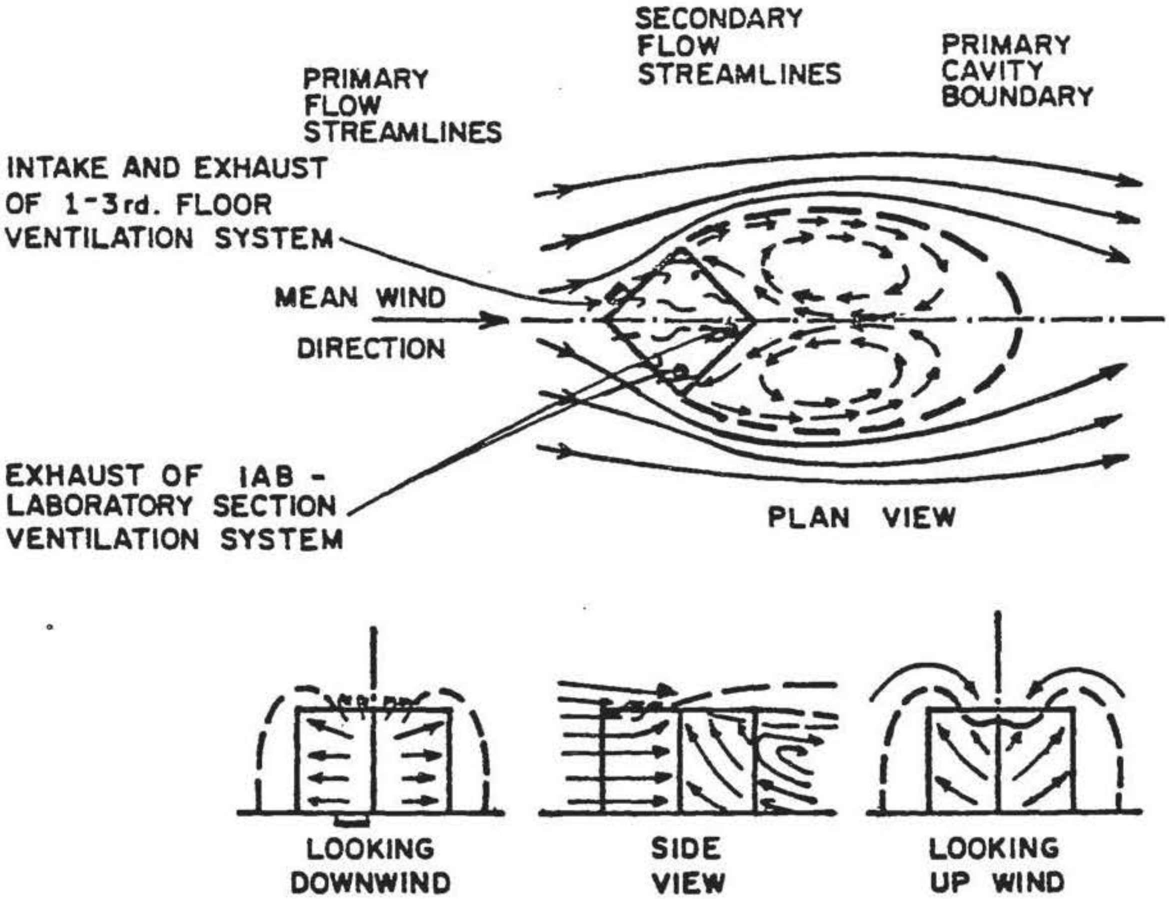

Figure 2. Flow near a cube on the ground, corner orientation. *(Halitsky, 1963)*

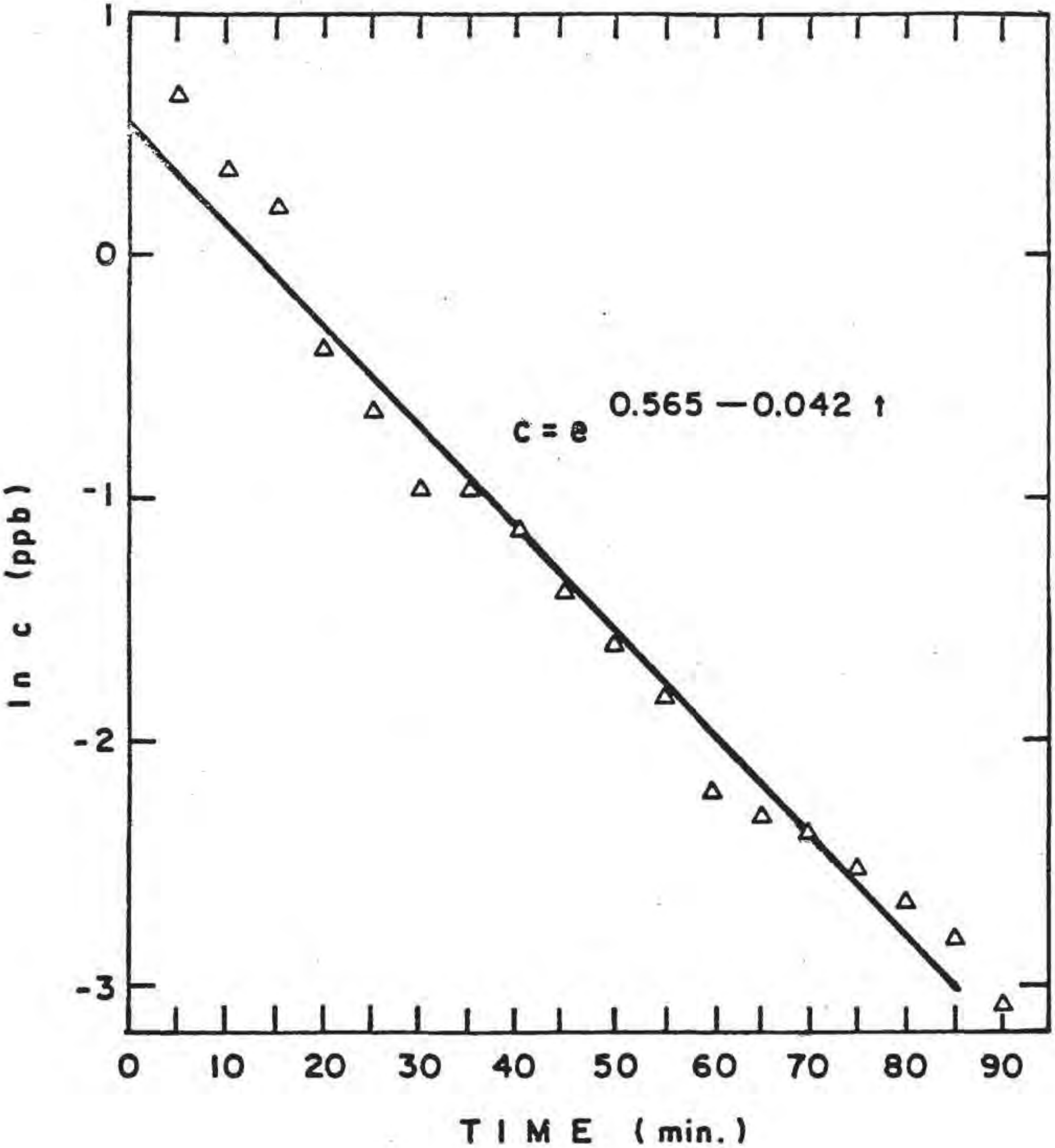

Figure 3. SF_6 concentration vs. time.

MEMORANDUM

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL

: Mr. Andrew Lucas, NIOSH
Through: Dr. Jim Melius, NIOSH

DATE: October 14, 1981

OM : Chief, Animal Breeding and Holding Section, CDC

BJECT: Follow-up Inspection of Laboratory Animal Care Program in the Institute of Animal Behavior at Rutgers

On tour with me on September 24, 1981 were Dr. Jay Rosenblatt, Ed Greenstein, D.V.M., and Mr. Gene Vincenti, and afterwards I was in conference with them, several faculty/staff members, and others.

With reference to my memo dated July 9, 1980 regarding my initial inspection I was most pleased this time with improvement that had been made during the interim. Temperature control and ventilation felt adequate. The previous plumbing problems and associated leakage problems appeared to have been corrected. The Dexotex floor sealant aided in solving the leakage problems and added greatly to the appearance of the floor. General housekeeping was vastly improved--the area was much cleaner, neater, and less cluttered than when I saw it last.

An effective vermin control program appears promising there. I witnessed three methods of controlling wild mice 1) live traps, 2) glue trays, and 3) poison bait--all appeared effective because a number of trapped or dead mice were observed during my inspection. I suspect that the presence of wild rodents may continue to be a problem (as they are nearly impossible to eliminate completely) and recommend that a relentless control program be maintained constantly. Obviously strict housekeeping techniques and proper technical supervision will also be necessary.

On my initial inspection I understood there to be 10-12 animal facility employees; however, there are, in fact, only 4. One of these now has the responsibility as work leader and supervises the other 3. Considering the general nature of the animal care duties at the Institute, I would recommend a time and motion study there for I feel the area is understaffed and the duties of the employees are spread pretty thin contributing to several of the inherent problems. I feel that approximately 2 more full-time employees will be needed to properly conduct this animal care program, and I would highly recommend tnat a well trained and experienced animal technician or technologist (such as a laboratory animal technologist certified by the American Association for Laboratory Animal Care) be employed to manage this animal facility.

Furthermore, I would highly recommend that Rutgers make every effort possible to achieve accreditation by the American Association for Accreditation of Laboratory Animal Care (AAALAC) as soon as possible. A periodic peer review that certifies one's ongoing animal care program is satisfactory by national standards makes for very good public relations and especially good rebuttal for most any major criticisms, whether just or unjust, of an animal care program.

Although I did not see necropsy records, discussions with key individuals on the inspection regarding animal deaths for the past several years revealed nothing suspicious of zoonotic diseases. Occasional deaths from nonspecific causes are quite normal in any animal population, and I am quite reluctant to recommend such extreme measures as necropsying all animals that die as a method of assessing the animal population health status.

My recommendations regarding necropsy procedures are as follows:

1. Necropsy all cats and monkeys that die.
2. Necropsy any animals when deemed necessary by the University Veterinarian, in particular as part of the diagnostic procedure when investigating unusual morbidities and/or mortalities.
3. Maintain a file of necropsy records in a central location.

Again, as last year, the animals and birds I saw appeared to be in good health and well cared for.

Samuel R. Adams, Jr., D.V.M.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
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