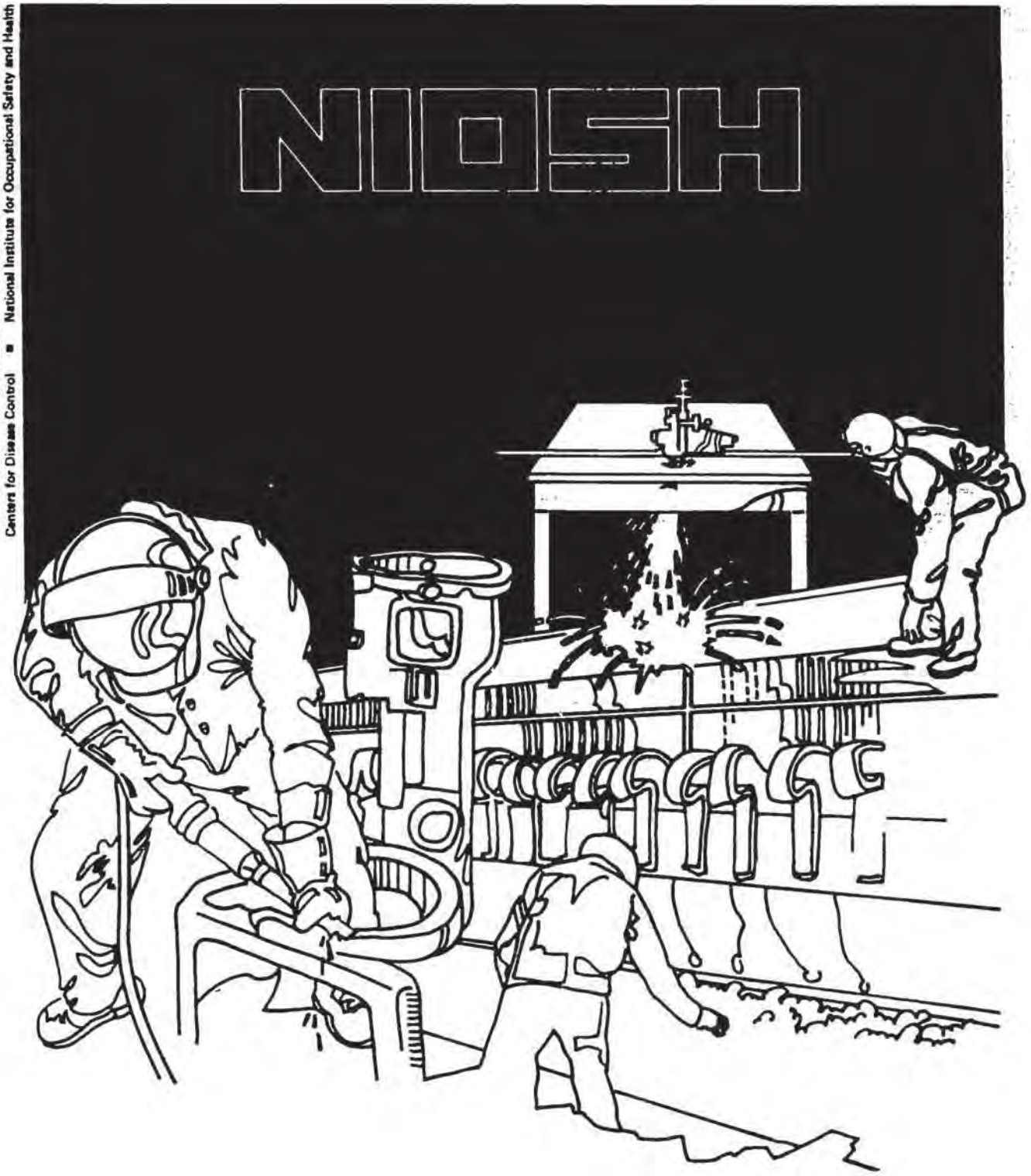
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



# Health Hazard Evaluation Report

HETA 82-236-1316
THE TIMES-MAIL
BEDFORD, INDIANA

HETA 82-236-1316
MAY 1983
THE TIMES-MAIL
BEDFORD, INDIANA

NIOSH INVESTIGATOR:
John N. Zey, I.H.

## I. SUMMARY

In April 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request to conduct a health hazard evaluation in the Composing Room from the management of The Times-Mail, Bedford, Indiana. The request was prompted by an employee's concern about the discoloration of lenses in several pairs of tinted eyeglasses.

In June 1982, a NIOSH survey team conducted an investigation at the Bedford facility. Airborne samples were collected to measure workers' exposure to acetic acid and to total particulates. In addition, a canopy hood located above a processor/developer in the canopy room was evaluated using smoke tubes and a constant-temperature thermal anemometer. Workers symptoms were evaluated by means of a short medical questionnaire administered to 10 Composing Room employees.

The environmental survey found that airborne concentrations of acetic acid in two samples were 0.74 and 5.2 $mg/m^3$. Airborne concentrations of total particulates were 0.09 and 0.14 $mg/m^3$. All samples are low when compared to the lowest current criterion of 25 $mg/m^3$ (OSHA and ACGIH) for acetic acid and 10 $mg/m^3$ (ACGIH) for total particulates.

Results of air velocity measurements taken at and near the canopy hood indicate that the hood was not effectively capturing exhaust emissions above the dryer and/or processor.

Questionnaire data revealed no known work-related health problems.

No definitive answer as to what caused the discoloration of tinted plastic eyeglass lens was found.

Based on the results of this investigation, NIOSH has determined that a health hazard did not exist for employees working in the Composing Room. A recommendation is made in Section VIII for modifying or adjusting the canopy hood to improve its performance.

KEYWORDS: SIC 2711 (Newspapers: Publishing and Printing), photocomposition, acetic acid, total particulate, tinted plastic eyeglass lens discoloration.

## II. INTRODUCTION

On April 26, 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request from the management of The Times-Mail, Bedford, Indiana, for a health hazard evaluation to determine if employees working in the Composing Room were being exposed to hazardous concentrations of two stabilization process chemicals. The request was the result of an employee's concern about the discoloration of several pairs of tinted plastic eyeglass lenses.

NIOSH conducted an initial survey at the Bedford Times-Mail on June 29, 1982. The initial visit consisted of an opening conference, a walk-through survey, general area environmental sampling, administration of short medical questionnaires to 10 employees working in the Composing Room, and a closing conference.

NIOSH distributed an interim report in January 1983, which presented the preliminary results of this investigation.

## III. BACKGROUND

The Bedford Times Mail began production in 1894 and moved to its current location in 1947. The company employs 70 people (45 full time) and prints three separate newspapers with a total production of approximately 20,000 copies per day. In 1972, the facility converted from hot metal printing to photo composition. This conversion resulted in several mechanical techniques being replaced by photographic processes.

The Composing Room measures 40 by 50 feet and has approximately 12 employees who are involved in three simultaneous processes called advertising composition, composition of newspaper pages, and photographic processing. All three processes contribute toward completion of individual paste-up pages. Each paste-up page contains various combinations of advertisements, news stories, and photographs. After a paste-up page is assembled, a negative is taken of it. The negative is sent to the plate making department and subsequently plates are sent to the printing department.

A processor-developer (processor) is located in the Composing Room. The processor, which is approximately 2' x 2' x 3', is used by employees to develop type that has been produced in a typeset machine. Employees open the top of the processor and insert a metal canister which contains predeveloped photosensitive paper. The processor is enclosed, except for the exit through which the developed paper is automatically transferred into a dryer. An employee remains at the processor only long enough to develop the type. This normally takes less than five minutes and occurs at varying intervals throughout the day. The processor contains two proprietary chemicals. The first is an activator, which is an aqueous solution whose major component is

potassium hydroxide at less than 10%. The activator begins the development of the photosensitive paper. The second chemical is a stabilizer, which is an aqueous acidic solution whose main components are ammonium thiocyanate at approximately 20% and acetic acid at less than 10%. The stabilizer stops the development process. The dryer, located immediately adjacent to the processor, is enclosed except for the front and back. The dryer is exhausted by a canopy hood. The hood, located 14 inches above the dryer, covers the dryer and extends over the exit end of the processor.

## IV. METHODS AND MATERIALS

An opening conference, attended by management personnel, an employee from the Composing Room, and two NIOSH industrial hygiene personnel, was held to explain the purpose of the investigation and describe the actions to be taken during the survey. Subsequent to the opening conference, a short walk-around survey was conducted in the Composing Room. Area airborne samples for total particulates and acetic acid were collected at the processor/dryer and on a support beam approximately 6 feet away. The location of area samples was limited to the existing structures in the Composing Room.

Area samples rather than personal were collected due to several factors: First, it was not possible to collect full-shift samples after the opening conference was completed. Second, NIOSH industrial hygiene personnel believed it would be possible to evaluate the highest potential exposures by placing one set of samples at the processor/dryer. Third, personal samples were feasible during a return visit if results of the initial survey indicated a return visit was needed.

Airborne samples for total particulate were collected on polyvinylchloride filters attached via flexible tubing to battery-operated pumps calibrated at 1.5 LPM. The weight of each sample was determined by weighing the sample plus the filter on an electrobalance and substracting the previously determined tare weight of the filter. Tare and gross weighings were done in duplicate. The instrumental precision of weighings done at one setting was $\pm 0.01$ milligram. Sampling and analytical techniques are presented in Table I.

Environmental sampling was conducted to evaluate the potential for employee exposures to acetic acid and total particulates. The canopy hood located over the dryer was evaluated using smoke tubes and a constant-temperature thermal anemometer. A short medical questionnaire was administered to the employees working in the composing room.

Airborne acetic acid samples were collected on charcoal tubes attached via flexible tubing to a battery-operated pump calibrated at approximately 0.2 liters of air per minute (LPM). The samples were analyzed using gas chromatography according to NIOSH Method S-169

(modified).[1] Grab samples for airborne concentrations of acetic acid were collected using direct-reading indicator tubes. The airborne concentration of acetic acid was determined by the length of stain discoloration of the tube.

## V. EVALUATION CRITERIA

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 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, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based solely on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are

recognized toxic effects from high short-term exposures. Environmental criteria for acetic acid and total particulates are listed in Table I.

## VI. RESULTS

Table II presents the results of area airborne sampling for acetic acid and total particulates in the Composing Room. Airborne concentrations for acetic acid were 0.74 and 5.2 milligrams per cubic meter of air ($mg/m^3$). The highest concentration was obtained on the side of the dryer and is approximately 21% of the current environmental criteria of 25 $mg/m^3$ as a time-weighted average (TWA) for OSHA and ACGIH.[2,3] Airborne concentrations for total particulates were 0.09 and 0.14 $mg/m^3$. Both samples are less than 2% of the ACGIH TLV for total particulates of 10 $mg/m^3$.(2) There is very little difference between these 2 concentrations as evidenced by the fact that if both are rounded off to the nearest tenth, they are numerically equal.

Table III presents the results of grab samples for airborne acetic acid collected with direct-reading indicator tubes. One of four samples had an airborne concentration of 5 parts per million (ppm). A trace of acetic acid was found on one of the remaining samples and was not detected on the other two. The lowest current criterion is 10 ppm (OSHA and ACGIH as a TWA).[2,3] Grab samples cannot be compared directly to TWA criteria due to the difference in time units. In addition, certified direct-reading indicator tubes are certified to be accurate to within $\pm$35% at one-half the test concentration and $\pm$25% at one, two, and five times the test concentration.[4] The test concentration usually corresponds to the OSHA PEL.[3,4] The indicator tubes for acetic acid have not been certified so their accuracy may be less than that for certified indicator tubes. These results do, however, give an estimate of the concentration at the time of sample collection.

Table IV presents the air velocity measurements taken at the canopy hood located above the dryer. Mean air velocity measurements taken at the base of the canopy hood (14 inches above the top of the dryer) and at the midpoint between the dryer and the base of the canopy hood (7 inches above the top of the dryer) were 43 and 22 feet per minute (FPM), respectively. These readings indicate that the velocities are insufficient to adequately exhaust vapors from the dryer and/or processor. By comparison, the ACGIH suggests capture velocities of 50 to 500 FPM for canopy hoods, depending on cross drafts.[5] Similar results were obtained when smoke tubes were used to evaluate the airflow patterns near the hood. Only when smoke was emitted at the base of the hood was it exhausted. Smoke emitted near the top of the dryer and at the exit end of the processor was not exhausted.

The location of an air-conditioning intake may have added to the lack of exhaust by the canopy hood. The intake (located approximately 12 feet from the canopy hood) created a cross draft. Visual observation

of a plume released from a smoke tube between the intake and the processor showed the plume to be drawn directly into the intake. Smoke released at the processor (at the corner nearest the intake) tended to travel in the direction of the intake. In addition, as previously indicated, recommended capture velocities for canopy hoods depend on cross drafts. Therefore, the minimum capture velocity for this canopy hood would be higher than 50 FPM, due to the location of the air-conditioning intake.

Questionnaire data revealed no health problems which employees believed were work related, though back problems were listed as possibly work related by one employee.

Discussions with the employee whose tinted eyeglasses discolored revealed that four pairs of plastic lenses had faded or changed color over a 6-year period. Two pairs had faded to a lighter color, one pair had changed from gray to purple, and the fourth pair had one grey lens fade while the second lens changed to a light purple. The employee also reported that previous pairs of tinted plastic eyeglasses had not faded or discolored. The employee believed the problem coincided with a relocation at work that resulted in the employee being located approximately 6 feet from the processor in line between the processor and the air-conditioning intake.

## VII. DISCUSSION AND CONCLUSIONS

Results of airborne sampling for acetic acid and total particulates indicate that at the time of the NIOSH survey employees were not exposed to hazardous concentrations of these materials. In addition, questionnaire data revealed that there were no known work-related health problems.

The problem of discoloration of tinted plastic eyeglass lenses is interesting. Discussions with companies involved in making tinted plastic eyeglass lenses, with optometrists and opticians, resulted in various opinions concerning possible causes of the discoloration. Potential causes suggested included aging, ultraviolet radiation, chemical contamination, and smoking. Aging and ultraviolet radiation are probably contributing to the discoloration since most individuals questioned, stated that plastic tinted lens will eventually fade. These factors, however, should have affected the other plastic lenses and thus would not seem to be the main factor.

Chemical contamination of the plastic lenses could occur at work or during non-work activities. The employee whose eyeglass lenses changed color reported non-work activities involving very little chemical contact. Chemical contamination at work could occur from airborne chemicals or from contamination of employee hands and clothing and subsequent transfer of chemicals to the eyeglasses. The potential for both exists at the Bedford facility. Employee may contaminate their

fingers when loading canisters into the processor and/or removing processed type from the dryer. If this were a significant contributor to the problem, it would seem likely that the discoloration would be spotty or heavier on some areas of the lens. The discolorations were basically consistent, except for the pair in which one lens changed color and one faded. Even for this pair, the change for each lens was consistent. There is also potential for airborne chemical contamination. Air velocity measurements indicated that the canopy hood was not working adequately and the hood had only been in place approximately 6 months. The airborne concentrations obtained during the survey were low when compared to current environmental criteria. It is possible, however, that other components of the chemicals could be causing the discoloration or that relatively low airborne concentrations are sufficient to react with, and subsequently cause discoloration of the tinting in plastic eyeglass lenses.

Smoking also could have an affect as the employee is a long-time smoker. However, this should have affected the previous pairs of plastic lenses that did not fade.

In summary, a definitive answer as to what caused the discoloration of the lenses has not been determined. Aging and ultraviolet radiation would seem to be at least contributing as most individuals contacted reported that each will cause discoloration. Of the remaining potential causes, airborne concentrations of chemicals would appear to be the most likely contributor. This is due to a combination of factors including airborne concentrations of processor chemicals being detected away from the dryer, the poor performance of the canopy hood, the location of the employee between the processor and the air-conditioning intake, and the employee's belief that the problem coincided with the relocation at work. If airborne chemicals are contributing to the problem, improving the performance of the canopy hood should be beneficial.

## VIII. RECOMMENDATIONS

The canopy hood located above the dryer should be adjusted and/or modified to improve its performance. The addition of side curtains should improve the effectiveness of the hood by eliminating cross-drafts, however, a thorough evaluation of the room ventilation may be needed due to the location of the air-conditioning intake.

## IX. REFERENCES

1. National Institute for Occupational Safety and Health. NIOSH manual of analytical methods. Vol 4, 2nd ed. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1978. (DHEW (NIOSH) publication no. 78-175).

2. American Conference of Governmental Industrial Hygienists. Threshold limit values for chemical substances and physical agents in the workroom environment with intended changes for 1982. Cincinnati, Ohio: ACGIH, 1982.

3. Occupational Safety and Health Administration. OSHA safety and health standards. 29 CFR 1910.1000. Occupational Safety and Health Administration, revised 1980.

4. National Institute for Occupational Safety and Health. Supplement to the NIOSH certified equipment list. Morgantown, WV: National Institute for Occupational Safety and Health, 1981.

5. American Conference of Governmental Industrial Hygienists. ACGIH industrial ventilation: a manual of recommended practice. ACGIH Committee on Industrial Ventilation: Lansing, Michigan, 1982.

## X. AUTHORSHIP AND ACKNOWLEDGEMENTS

| | |
|---|---|
| Report Prepared by: | John N. Zey, M.S.<br>Industrial Hygienist<br>Industrial Hygiene Section |
| Field Evaluation Assistance: | Matthew London<br>Physical Science Aid<br>Industrial Hygiene Section |
| Laboratory Analyses: | Staff - Utah Biomedical Testing Laboratories<br>Salt Lake City, Utah |
| Originating Office: | Hazard Evaluations and Technical Assistance Branch<br>Division of Surveillance, Hazard Evaluations, and Field Studies |
| Report Typed By: | Debra A. Lipps<br>Clerk-Typist<br>Industrial Hygiene Section |

## XI. 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. The Times-Mail
2. Employee, The Times-Mail
3. NIOSH, Region V
4. OSHA, Region V

For the purpose of informing the approximately 12 affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE I

Sampling And Analytical Methods And Environmental Criteria

The Times-Mail
Bedford, Indiana
HETA 82-236

June 29, 1982

| Contaminant | Flow Rate (LPM) | Collection Media | Analytical Method | Environmental Criteria ($mg/m^3$ unless otherwise noted) OSHA | ACGIH |
|---|---|---|---|---|---|
| Acetic Acid | 0.2 | Charcoal Tube | Gas Chromatography According to NIOSH Method S-169 (Modified) | 25[A] | 25[A] |
| Total Particulate | 1.5 | PVC Filter | Gravimetric | 15[A] | 10[A] |
| Acetic Acid (Grab Sample) | - | Direct Reading Indicator Tube | Visual - Length of Discoloration | 10 ppm[A] | 10 ppm[A] |

NIOSH currently has no criteria for these materials.

A = 8.0-hour time-weighted average.
$mg/m^3$ = milligrams per cubic meter of air.
ppm = parts per million parts of air.

TABLE II

Composing Room Area Airborne Concentrations
of Acetic Acid and Total Particulates
Area Samples Collected in the Composing Room

The Times-Mail
Bedford, Indiana
HETA 82-236

June 29, 1982

| Location | Sample Time | Volume (Liters) | Contaminant | Concentration ($mg/m^3$) |
|---|---|---|---|---|
| Sample Attached To Dryer, On Side Of Dryer Toward Air-Conditioning Intake | 0904-1510 | 69 | AA | 5.2 |
| Sample Attached To Support Beam Located Approximately 6 Feet From Processor/Developer | 0906-1500 | 68 | AA | 0.74 |
| Sample Attached To Dryer, On Side Of Dryer Toward Air-Conditioning Intake | 0904-1504 | 540 | TP | 0.09 |
| Sample Attached To Support Beam Located Approximately 6 Feet From Processor/Developer | 0906-1503 | 536 | TP | 0.14 |

AA = Acetic Acid
TP = Total Particulates

Environmental Criteria ($mg/m^3$): Acetic Acid - 25 (OSHA, ACGIH as a TWA)
Total Particulate - 10 (ACGIH as a TWA)

TABLE III

Results of Grab Sampling for Acetic Acid
Samples Collected With Direct-Reading Indicating Tubes

The Times-Mail
Bedford, Indiana
HETA 82-236

June 29, 1982

| Location | Time | Concentration (ppm) |
|---|---|---|
| End Of Dryer Away From Processor | 1120 | ND |
| Sample Taken 6 Inches From Plastic Shield On Side Of Processor/Dryer Toward Air-Conditioning Intake | 1130<br>1140 | 5<br><5 |
| At Autotape 9000 Operator Station (Between Processor/Dryer And Air-Conditioning Intake) Breathing Zone Sample (Employee Sitting Down) | 1148 | ND |

ND = Not detected on indicator tube. Range of these specific detector tubes was 5 to 80 ppm.

<5 = This sample had definite discoloration, but amount of material was not sufficient for quantification.

Environmental Criteria (ppm): 10 (OSHA, ACGIH as a TWA)

TABLE IV

Air Velocity Measurements Obtained at the Canopy Hood,
Exhausting the Dryer in the Composing Room

The Times-Mail
Bedford, Indiana
HETA 82-236

June 29, 1982

| Reading Number | Location A Velocities (FPM) | Location B Velocities (FPM) |
|---|---|---|
| 1 | 60 | 30 |
| 2 | 70 | 30 |
| 3 | 60 | 50 |
| 4 | 10 | 10 |
| 5 | 60 | 10 |
| 6 | 50 | 30 |
| 7 | 30 | 10 |
| 8 | 20 | 10 |
| 9 | 30 | 20 |
| Mean | 43 | 22 |

ACGIH Industrial Ventilation Manual recommends capture velocity of 50 to 500 FPM for canopy hoods. Capture velocity required depends on cross drafts.

Location A = Base of canopy hood (14 inches above top of dryer).
Location B = Midpoint between dryer and base of canopy hood (7 inches above top of dryer).