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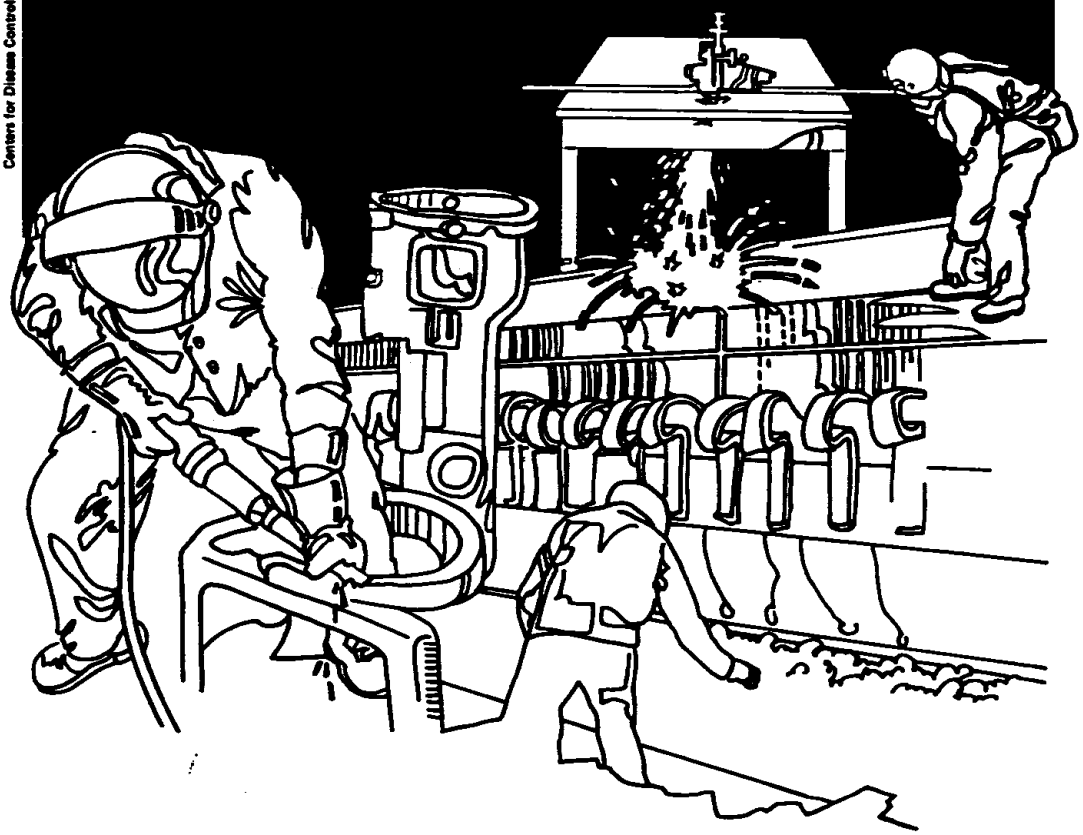

Health Hazard Evaluation Report

HETA 90-362-2105
GANNETT-ROCHESTER NEWSPAPER
ROCHESTER, NEW YORK

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 and 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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

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I. SUMMARY

On August 9, 1990, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at the Gannett-Rochester Newspaper, Rochester, New York. NIOSH was asked to evaluate the potential mercury exposure from silver-coated paper used in photo laser machines.

On November 28-29, 1990, NIOSH conducted an industrial hygiene survey. General air samples and personal breathing zone samples for inorganic mercury and dust were collected; direct reading measurements using a Jerome Model 411 Gold Film Mercury Analyzer were taken throughout the process cycle; and bulk samples of paper and paper dust were collected for analysis of mercury content.

Airborne concentrations using the Jerome Mercury Analyzer ranged from non-detectable to 15 micrograms per cubic meter (ug/m^3). The highest levels were found during the record and heating modes. These concentrations were below the currently recommended exposure level of 50 ug/m^3 set by NIOSH, OSHA, and ACGIH.

Mercury vapors and dust were collected using a sampling train consisting of a cellulose ester membrane filter followed by a solid sorbent tube (hopcalite) and analyzed using cold vapor atomic absorption spectroscopy. The mercury content of bulk paper and paper dust samples were also measured using the same technique. All of the personal and area samples showed non-detectable airborne concentrations for inorganic mercury. The unprocessed paper contained 230 micrograms mercury per gram of sample (ug/gram) and the processed paper had 210 ug/gram of inorganic mercury. The paper dust from inside the machine contained 91 ug/gram of mercury, while the dust from the outside fan had 6.8 ug/gram. The dust collected from the floor surrounding the machines did not contain detectable levels of mercury. There is the potential for skin absorption of mercury from handling the paper and dust. There are currently no criteria addressing this type of exposure.

The environmental sampling data indicate that the mercury levels found around the photo laser machines do not constitute any long or short term health hazard to the employees working with or around the machines. Working directly with the paper and dust inside the machine does have the potential for higher exposure because of possible skin absorption of mercury.

KEYWORDS: SIC 2711 (Newspapers: Publishing, or Publishing and Printing), mercury, photo laser machines.

II. INTRODUCTION

In August 1990, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at the Gannett Rochester Newspapers in Rochester, New York. The request was submitted by an authorized employee representative and expressed concern over potential inorganic mercury exposure to staff working with and around photo laser machines. No symptoms were reported in the request. A site visit was conducted on November 28-29, 1990, to evaluate this issue.

A. Facility Description

The Gannett-Rochester newsroom is located on the fourth floor of a multi-storied building in downtown Rochester. The newsroom is an open area, housing the afternoon newspaper editorial staff on one half, and the morning newspaper staff on the other, with the wire room and two other common areas located between. The wire room houses three photo laser machines and is separated by plexiglass half-walls from the rest of the office areas.

B. Process Description

The photo laser machines are manufactured by Associated Press Communications. The Material Safety Data Sheet (MSDS) indicated that the dry silver paper used in the AP photo laser machines contains less than 0.1% mercuric bromide. The process time for each photo depends on the size of the photo. The machines function 24 hours a day in a non-consistent pattern. Two are on-line at all times; the third functions as a back-up.

The machine receives an audio signal which the laser beam interprets into different intensities onto the silver-coated paper. The paper is cut from the large roll and enters an oven which fixes the image. The oven builds up a blackened substance which can interfere with the automatic paper feed system and add streaks to the developing pictures, therefore, the oven is cleaned every three to four weeks. The paper roll is replaced about every five days. The wire room manager is usually responsible for cleaning the oven and removing the excess dust in the machine.

One machine receives the audio signal from a satellite; the other, over telephone lines. The photo laser machines have been used since 1978. The photo laser machine with the satellite hook-up has been used since 1988.

C. Population Potentially at Risk

The news staff of both newspapers work flexible hours since they are out in the field following up on stories. The wire room area is staffed around the clock with usually seven people in

the editorial department. The editorial/wire room staff perform many duties which require high mobility. The wire room manager spends a major portion of the workday in the wire room area.

III. MATERIALS AND METHODS

On November 28, 1990, after the opening conference, which was attended by management and union representatives, a walk-through survey of the areas of concern was conducted. On November 29, 1990, environmental monitoring was undertaken.

Direct mercury vapor measurements were obtained using a Jerome Instrument Corporation's Model 411 Gold Film Mercury Vapor Analyzer. This instrument utilizes a thin gold film which selectively absorbs inorganic mercury from a measured air volume. This absorption results in an increase in electrical resistance across the film which is proportional to the mass of inorganic mercury in the sample. The analyzer was used in the "sample mode" which collects a 125 milliliter air sample and has a minimum detectable concentration of 1 microgram of mercury per cubic meter of air (ug Hg/m^3) [1]. Sampling was conducted in the vicinity of the machines at different times throughout the process cycle.

Area samples and one personal breathing zone sample for inorganic mercury vapor and dust were collected using a sampling train consisting of a cellulose ester membrane filter followed by a solid sorbent tube (hopcalite). A battery operated sampling pump calibrated at 0.2 liters per minute was used to collect the air sample. After sampling, the hopcalite was ashed with nitric and hydrochloric acids. After dissolution was complete, the samples were diluted with deionized water. The mercury was then reduced by the addition of stannous chloride and the samples were analyzed by cold vapor atomic absorption spectroscopy. The limit of detection (LOD) for this method is 0.05 ug per sample. The limit of quantitation (LOQ) is 0.17 ug per sample.[2]

The process for analyzing the cellulose ester membrane filters was similar. Sulfuric and nitric acids were added to the filters and heated in a steam bath. Deionized water, potassium permanganate ($KMnO_4$), and potassium persulfate ($K_2S_2O_8$) were added, and the filters were heated an additional half hour in the steam bath. In order to reduce the permanganate, hydroxylamine hydrochloride (NH_2OH-HCl) was added. Stannous chloride was added to reduce the mercury which was then analyzed by cold vapor atomic absorption spectroscopy. The LOD for this method is 0.05 ug of mercury per sample. The LOQ is 0.17 ug of mercury per sample.

Bulk samples of processed and unprocessed paper and paper dust from various locations were collected. The mercury content was analyzed using the same method as that used for the cellulose ester membrane

filters. The LOD for this method is 0.7 ug of mercury per sample. The LOQ is 2.4 ug of mercury per sample.

Additionally, air movement around the photo laser machines was checked using smoke tubes.

IV. EVALUATION CRITERIA

In order to assess the hazards posed by workplace exposures, industrial hygienists use a variety of environmental evaluation criteria. These criteria propose exposure levels to which most employees may be exposed for a normal working lifetime without adverse health effects. These levels do not take into consideration individual susceptibility such as pre-existing medical conditions or possible interactions with other agents or environmental conditions. Evaluation criteria change over time with the availability of new toxicologic data.

There are three primary sources of environmental evaluation criteria for the workplace: 1) NIOSH Recommended Exposure Limits (RELs), 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs), and 3) the U.S. Department of Labor (OSHA) Permissible Exposure Limits (PELs). The OSHA PELs may include the feasibility of controlling exposure in various industries where the agents are used; the NIOSH RELs are based primarily on concerns relating to the prevention of occupational disease. It should be noted while reviewing this report that industries are legally required to meet those levels specified by an OSHA standard.

NIOSH currently recommends that exposure to inorganic mercury vapor be limited to 50 micrograms per cubic meter (ug/m^3) determined as a time weighted average exposure for up to an 8-hour workday.[3] The ACGIH recommends a 50 ug/m^3 TLV for mercury vapor.[4] The OSHA PEL for mercury vapor is 50 ug/m^3.[5] NIOSH and OSHA also have a ceiling level of 100 ug/m^3 that should not be exceeded at any time during a workday.[4,5] Inorganic mercury has been designated with a skin notation indicating that there is a potential contribution to the overall exposure by the cutaneous route. There are currently no criteria that address mercury exposure from paper or dust contact.

V. TOXIC EFFECTS OF INORGANIC MERCURY

Acute exposure to high concentrations of inorganic mercury vapor can cause headaches, cough, chest pains, chest tightness, and difficulty in breathing. Additionally, mercury can also produce soreness of the mouth and gums, nausea, fever, and diarrhea.[6,7]

Chronic exposure to mercury is more common, with the central nervous system as the target organ. The clinical manifestation is called erethism, which results in various personality changes associated with mercury intoxication. These changes include increased

irritability, depression, paranoia, insomnia, loss of memory, and tremors of the limbs (usually the hands). Mercury may be unsuspected as the cause of these symptoms since their onset is gradual. Other symptoms of chronic mercury intoxication include inflammation of the mouth and gums, damage to the kidneys (proteinuria, which can lead to nephrosis), allergic skin rash, loss of appetite and weight, fatigue, and anemia.[8]

VI. RESULTS

Data taken during the process cycle of the photo laser machines using the Jerome Model 411 Mercury Vapor Analyzer are shown in Table 1. Airborne concentrations ranged from non-detectable levels to 15 micrograms per cubic meter. The highest levels were found during the record and heating modes.

The results from the area and personal monitoring are presented in Tables 2 and 3. All of the samples showed non-detectable airborne concentrations of inorganic mercury.

The mercury concentrations found in the bulk samples of paper and paper dust are shown in Table 4. The unprocessed paper contained 230 micrograms of mercury per gram of sample (ug/gram) and the processed paper had 210 ug/gram of inorganic mercury. The paper dust from inside the machine contained 91 ug/gram of mercury, while the dust from the outside fan had 6.8 ug/gram. The dust collected from the floor surrounding the machines did not contain detectable levels of mercury.

The ventilation around the three photo laser machines was examined using smoke tubes. Results indicated that there was adequate air movement around each of the machines at the time of the survey. There was no additional ventilation in the vicinity of the machines.

The OSHA 200 log was reviewed but no cases were identified which might be linked to inorganic mercury exposure.

VII. DISCUSSION AND CONCLUSIONS

The airborne mercury levels generated by the photo laser machines were non-detectable or extremely low. The airborne mercury concentrations surrounding the photo laser machines do not constitute any long or short term health hazard to the employees working with or around the machines. Direct read instrumentation provides an indication of the airborne concentration at a specific point in time. It is useful in determining the presence of a compound. Time weighted samples are used to determine an average exposure over a longer period of time. Working directly with the paper and dust inside the machine poses a potential hazard due to possible skin absorption of mercury.

VIII. RECOMMENDATIONS

The following recommendation is made as a result of the conditions encountered during the NIOSH survey:

1. To prevent skin contact with inorganic mercury, nitrile rubber gloves should be worn while cleaning the oven, removing paper dust from inside the machine, and restocking the paper.

IX. REFERENCES

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1. Gannett-Rochester Newspaper
2. The Newspaper Guild
3. Rochester Newspaper Guild
4. OSHA, Region 2

For the purpose of informing 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 1

Results from Area Survey with Jerome Model 411
Mercury Vapor Analyzer

Gannett Rochester Newspaper
Rochester, New York
HETA 90-362

November 29, 1990

Process	Concentration ug/m^3*
Record Mode	0
Record Mode	0
Record Mode	0
At Beginning of Heat Mode	0
In Middle of Heat Mode	0
While Finished Photo was Exiting Machine	0
After Heat Mode Finished	0
Record Mode	15
Record Mode	1
Record Mode	0
Record Mode	0
Record Mode	3
Record Mode	0
Record Mode	0
Record Mode	0
At Beginning of Heat Mode	1
After Heat Mode Finished	0
Record Mode	0
At End of Heat Mode	4
After Finished Photo Exited Machine	0

* ug/m^3 - micrograms per cubic meter
** ND - None Detected
Limit of Detection (LOD): 1 microgram Mercury/cubic meter

Table 2

Results of Personal Breathing Zone
and Area Mercury Samples

Mercury Vapor
Solid Sorbent Tubes

Gannett Rochester Newspaper
Rochester, New York
HETA 90-362

November 29, 1990

Sample Location	Sample Time	Sample Volume (Liters)	Concentration (ug/m^3)*
Personal:			
Wire Room Manager	9:12 - 16:45	91.2	ND**
Area:			
Wire Room Beside Copier	9:14 - 16:30	85.8	ND
Wire Room - Two Machines	9:21 - 16:35	86.6	ND
Wire Room - Single Machine	9:24 - 16:33	85.8	ND
Copywriter Area	9:24 - 16:39	86.2	ND
NIOSH Recommended Exposure Limit			50
OSHA Permissible Exposure Limit (Ceiling)			100

* ug/m^3 - micrograms per cubic meter
** ND - None Detected

Limit of Detection (LOD): 0.05 micrograms Mercury/sample
Limit of Quantitation (LOQ): 0.17 micrograms Mercury/sample

Table 3

Results of Personal Breathing Zone
and Area Mercury Samples

Particulate Mercury
Cellulose Ester Membrane Filters

Gannett Rochester Newspaper
Rochester, New York
HETA 90-362

November 29, 1990

Sample Location	Sample Time	Sample Volume (Liters)	Concentration (ug/m^3)*
Personal:			
Wire Room Manager	9:12 - 16:45	91.2	ND**
Area:			
Wire Room Beside Copier	9:14 - 16:30	85.8	ND
Wire Room - Two Machines	9:21 - 16:35	86.6	ND
Wire Room - Single Machine	9:24 - 16:33	85.8	ND
Copywriter Area	9:24 - 16:39	86.2	ND
NIOSH Recommended Exposure Limit			50
OSHA Permissible Exposure Limit (Ceiling)			100

* ug/m^3 - micrograms per cubic meter
** ND - None Detected
Limit of Detection (LOD): 0.05 micrograms Mercury/sample
Limit of Quantitation (LOQ): 0.17 micrograms Mercury/sample

Table 4

Mercury Content in Bulk Samples

Gannett Rochester Newspaper
Rochester, New York
HETA 90-362

November 29, 1990

Sample Type	Concentration (ug/g)*
Dust From Fan Screen On Outside of Machine	6.8
Dust From Inside of Machine	91
Dust From Floor Surrounding Machine	ND**
Unprocessed Paper	230
Processed Paper	210

* ug/g - micrograms per gram of sample
** ND - None Detected

Limit of Detection (LOD): 0.7 micrograms Mercury/gram sample
Limit of Quantitation (LOQ): 2.4 micrograms Mercury/gram sample