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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-136-284

GAF OFFICE SYSTEMS DIVISION
JOHNSON CITY, NEW YORK

APRIL 1976

I. TOXICITY DETERMINATION

A. Ball Milling, Dye Kitchens and Organic Solvent Based Coating (Q and L Machines).

It has been determined on the basis of the medical and environmental data collected during the period of this evaluation that methyl ethyl ketone, acetone, toluene, methyl cellosolve, diazonium salts, azo dyes and nuisance dusts are not toxic at the concentration measured within the worksites during normal operating conditions. Short term potentially toxic exposures to acetone and MEK may exist in the back wet area of Q machine. Area samples indicate airborne concentrations of solvents which were significantly higher than those found in breathing zone samples. Employees would not normally encounter these higher concentrations except for short terms during routine operations but may encounter them for longer periods during maintenance procedures. Under such maintenance procedures, employees should be provided with the appropriate protective equipment.

A potential health hazard due to exposure to silica may exist during the preparation of the coating solutions. Two samples for silica were taken on the dye kitchen workers and silica levels were found to be 50 ug/M^3 and 10 ug/M^3. Analysis of bulk silica samples performed by x-ray diffraction show that of the samples analyzed, one contained 100% crystalline quartz. NIOSH recommends that occupational exposure should be controlled so that no worker is exposed to a concentration of free silica greater than 50 micrograms per cubic meter of air. Because of the variations in the type of silica compound used, frequency of use and quantity used, environmental measurements considering all variables were impossible within the scope of this evaluation. However, on the basis of the data taken and on information on the type and amount of silica used, a potentially toxic situation may exist in relation to silica exposure. Employees therefore should be informed of the potential hazards of silica and supplied with proper protective equipment.

B. Converting Departments

On the basis of environmental data collected, it may be concluded that no health hazard existed from exposure to nuisance dusts in the converting departments. Measured concentrations for total airborne particulates were all found to be well below existing standards.

C. Felter's Building

It has been determined on the basis of employee interviews, observation of work practices and environmental sampling that a potential health hazard from exposure to silica may exist within the worksite. Observations indicate that the highest exposure occurs during unloading and storage operations of silica containing compounds. The wide variability in the frequency of shipments of these compounds and in their condition upon arrival made measurements of the variation in concentrations produced impossible during the time scope of this evaluation. However, based on the sampling which was performed and on observation of work practices, employees should be informed on the potential hazards of silica. Respirators should be provided for all employees medically fit to wear respirators and used during operations where dusts are produced.

D. Cardiovascular Disease

Based on a cross-sectional analysis of employee medical records and analysis of medical records of persons supplied to NIOSH by the local union, it is concluded that the possibility exists that an excess number of cases of cardiovascular diseases have occurred at GAF. An in depth retrospective mortality study would be required to answer definitively whether or not an excessive mortality from cardiovascular diseases has occurred at GAF. It is recommended that such a study be carried out by NIOSH.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from NIOSH, Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226. Copies have been sent to:

a) GAF Office Systems Division, Johnson City, New York
b) Authorized Representative of Employees
c) U. S. Department of Labor - Region II
d) NIOSH - Region II

For the purpose of informing the approximately 125 "affected employees" this report shall be posted in a prominent place(s) readily accessible to workers for a period of at least 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an 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 National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of Local Lodge 1807 of the International Association of Machinists and Airospace Workers regarding the exposure of workers to excessive dusts, mists and a variety of chemical compounds and solvents. It was further alleged that employees were experiencing medical illness, early retirement and death from cardiovascular disease at early ages as a result of their work at GAF.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

The GAF Office Systems Division, Johnson City, New York, manufactures repro-sensitizing products which include reproduction paper, microfilm and electrophotographic paper. The scope of this health hazard evaluation included four different processes in which five different areas of the plant were involved.

1. Ball Mill and Dye Kitchens (1, 2, 66)
2. Organic Solvent Based Coating (Q and L Machines)
3. Converting Department and Clean Room Converting Department
4. Felter's Building

1. Dye Kitchens and Ball Milling Area

The solutions used in the coating processes are prepared in the dye kitchens with the exception of L Machine where the solutions are prepared in the ball milling area. Fourteen men, employed as dye mixers, are involved in the preparation of solutions for the coating machines. Three to five dye mixers work per shift and rotate between the various kitchens. The solutions are prepared in large, open mixing vessels. Compounds are manually measured according to specific formulations and added to the mixing vessels. The coating solutions prepared consist of four main components: solvent, diazo compounds, couplers and stabilizers. The solvents commonly used are water, methyl cellosolve and methyl ethyl ketone (MEK).

The coating solutions for the L Machine are prepared in the ball milling area. Toluene is the sole solvent employed in the area, with zinc oxide being one of the major compounds used. The coating solutions are prepared in a manner similar to that described above, only the solutions are heated. Workers in the area wear disposable dust masks and rubber gloves during mixing operations.

Lacquers are also frequently mixed in the ball milling area. The most common solvent used is methyl isobutyl ketone (MIBK) but the use of MEK or methyl cellosolve acetate is not unusual.

2. Organic Solvent Based Coating

The Q Machine is located in a section known as the clean area which is used for the production of microfilm. Approximately six employees work in the area per shift as coaters and machine tenders. The paper at the Q Machine is coated both with the coating solution and also with a solvent (backwet process).

In the coating process the paper passes through a series of rollers during which time it passes through the coating solution contained in a sensitizing tray. (The sensitizing tray and rollers are washed at the beginning of each shift, usually with MEK). The backwet process consists of applying a solvent to the back of the paper. The backwet section of the operation is located in a small enclosed area with some local ventilation. The machine tender spends about two minutes out of every ten minutes in this area checking the operation. Acetone is the most commonly used solvent but methanol, isopropanol and methanol lacquers also are used.

The L Machine is a toluene solvent based coating operation. Two to three employees work in the area. The coating machine is enclosed in the back where the coating process occurs. Under normal operating conditions, exposure to the highest toluene concentrations in the enclosed area would be for three to five minutes out of every half hour during the entire shift.

3. Converting Department

After coating, the paper is brought to the converting department to be cut into appropriate sized sheets and packaged for shipment. Most of the cutting is performed on guillotine cutters. Employees complained about dust which is produced during this operation. A similar process is conducted in the section designated as the clean area where microfilm cutting and packaging is handled. There are 91 employees working in the converting departments, of which a much smaller number are involved in the actual cutting operations.

4. Felter's Building

The Felter's Building is a separate building from the remainder of the plant and serves as a warehouse for a wide variety of substances. A considerable quantity of the substances stored in the area are contained in paper bags. Exposure to dust occurs as a result of handling bags of material which have ruptured during shipment or storage operations. Concern arises because a considerable quantity of the material in which handling problems are experienced contains silica. Dust is also present as a result of general poor housekeeping practices.

B. Evaluation Design

A preliminary observational survey was conducted (January 13-15, 1975) to facilitate identification of the most probable health hazards. A more in-depth survey was conducted April 8-10, 1975. Procedures used to assess the validity of the alleged hazards included: preliminary interviews with management and union representatives, a walk-through survey of the work areas, administration of brief medical questionnaires to workers potentially exposed to contaminants, the collection of urine samples for biochemical analyses and extensive environmental air sampling to determine concentrations of potentially toxic agents in the work areas. A review of the corporate medical records was conducted on January 12-13, 1976 following a considerable time delay in which NIOSH was forced to institute legal proceedings to obtain access to GAF medical records.

C. Evaluation Methods

1. Environmental

Employee exposures to solvent vapors were measured via personal air sampling equipment. Air samples were collected using charcoal tubes in the breathing zone of the exposed workers and in various areas where it was thought the highest concentrations of solvent vapors would exist. Both short and long term samples were collected. The charcoal tubes were analyzed by a gas chromatographic procedure.

Samples for total airborne particulates and silica were collected on filters. Total particulate samples were collected on preweighed AA filters. Respirable silica exposures were measured using 10 mm nylon cyclones. The silica samples were collected on PVC filters and analyzed using a colorimetric wet chemical method. Bulk samples of the silica containing compounds were collected and the crystalline content of the samples was determined by X-ray diffraction.

Samples were taken on AA filters for total diazonium salts and total azo dyes. Duplicate samples were drawn through AA filters with a total volume sampled of 500 plus liters. One of the duplicates was analyzed for the total salt concentration and the other for the total azo dye concentration. Bulk samples were taken of the salts and dyes being processed on the day of sampling and were used for the purpose of establishing standard curves. A digital Beckman readout of sample absorbance compared to standard curves of the bulk samples determined the concentration of diazonium salts. Concentrations are reported as a range due to the different absorptivities of salts that could have been present. Samples used to determine the total azo dye concentration were scanned on a Cary 15 spectrophotometer. As there was no detection of absorbance for any sample, no readings were made on the Beckman 25 spectrophotometer.

2. Medical

Employees were privately asked non-directed questions followed by directed questions regarding their health and employment. A limited physical examination was conducted, if deemed necessary, and urine samples were collected for the measurement of hippuric acid excretion. Individuals were asked to collect their urine in polyethylene containers after 1 p.m. Individuals also were asked to note what they ate for breakfast, lunch and any snacks they might have had on break. This procedure was carried out on two successive days. Hippuric acid determinations were performed according to the method of Tomokuri and Oguta.[1] All values were corrected to a specific gravity of 1.024. In order to evaluate the allegation that there was an excessive mortality from cardiovascular disease at GAF, medical records of persons currently employed and of persons on a list provided by the Union were examined. Analysis of these data were made by NIOSH statisticians.

D. Evaluation Criteria

The adverse effects from excessive exposure to many substances are well known. The following is a list summarizing the adverse effects of excessive exposure to various substances that workers at GAF come into contact with.

Nuisance Dusts

Nuisance dusts[2] have little adverse effects on the lungs and do not produce significant disease or toxicity when exposures are kept under reasonable control. These dusts are biologically inert in that when inhaled the architecture of the alveoli remains intact; little or no scar tissue is formed; and any reaction provoked is potentially reversible. Excessive concentration in workwoom air may reduce visibility, cause unpleasant accumulations in the eyes, ears, nose, and secondarily cause injury to the skin due to vigorous cleansing procedures necessary for their removal.

Silica

Finely divided silica in the free state can cause silicosis, a fibrotic lung disease. This form of pneumoconiosis usually occurs only after a number of years of exposure, although it can occur in a short time with severe exposure. The acute form may be recognized after 8 to 18 months from the first exposure. Patients may note severe shortness of breath and rapid breathing and chest X-rays may show fibrosis. However, an uncomplicated case may progress to an advanced stage showing little functional impairment. Chronic silicosis is the type often observed in industry and usually occurs after years of exposure to silica dust. Silicosis often progresses in spite of termination of exposure and becomes incapacitating to the affected workers. Prevention is extremely important since treatment is not effective.

Acetone

Acetone presents a low degree of hazard to health under conditions of industrial handling. It is low in acute oral toxicity but very slightly irritating to the skin even after rather prolonged exposure; and is moderately irritating to the eyes. It is slightly toxic, causing narcosis with no systemic injury when inhaled in very high concentrations.

Methyl Ethyl Ketone (MEK)

Industrial exposures to MEK are mainly those of inhalation and skin and eye contact. Skin absorption, while it may occur, is not considered to present a problem. Exposure to vapors of this agent may produce mucous membrane irritation, skin irritation, dermatitis. More prolonged exposure may result in nausea, vomiting, headache, paresthesia, and narcosis.

Methyl Cellosolve

Prolonged exposure to this agent produces irritation of mucous membranes. This agent is not appreciably toxic to the skin but is readily absorbed through the skin in toxic amounts. It is appreciably toxic when inhaled. Systemic absorption may produce hematologic abnormalities, a toxic encephalopathy characterized by headache, drowsiness, lethargy, weakness, fatigue, ataxia, irregular and unequal pupils, and deep tendon reflex abnormalities. Fatal exposure both in humans and animals revealed renal changes on postmortem examination.

Toluene

This agent is well known for its powerful narcotic effects. Prolonged exposure to this agent may acutely cause headache, weakness, fatigue, unconsciousness, loss of coordination, nausea, vomiting, anorexia, parestheias of the skin and irritation of skin and mucous membranes.

Inhalation studies have shown that 16%-20% of the absorbed toluene is eliminated by the lungs unchanged. A very small portion may be excreted in the urine, but the major portion, approximately 80%, is oxidized to benzoic acid, conjugated with glycine and excreted in the urine as hippuric acid. Hippuric acid is a normal urinary constituent derived from food containing benzoate added as a preservative or occurring naturally. Coffee beans and certain fruits and vegetables, particularly plums, cranberries and prunes, are known to contain benzoic acid or precursors.

Several studies have indicated that there is a wide variation in hippuric acid excretion in nonexposed individuals. One American group found in nonexposed individuals a mean hippuric acid excretion of 0.8 gm/liter (range 0.4 to 1.4 gm/liter). However, a Japanese group had a mean hippuric acid excretion of 0.184 gm/liter (range 0.035-0.44 gm/liter). Such discrepancies may reflect wide differences in diet between American and Japanese subjects. Other studies have shown a direct relationship between environmental concentrations of toluene and urinary levels of hippuric acid "although within wide variations."[3,4]

To assess the concentrations of air contaminants found in the place of employment, three primary sources of criteria were used: (1) occupational health standards as promulgated by the U.S. Department of Labor (29 CFR Part 1910.1000); (2) recommended and proposed threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH)(1975); and (3) NIOSH criteria for recommended standards for occupational exposure to substances (Criteria Documents).

In the following tabulation of criteria, appropriate values are presented with references.

Substance	Permissible Exposures (8-hour Time Weighted Average)
[1]Total Nuisance Dust	10 mg/M^3
[2]Free Silica (respirable fraction)	50 ug/M^3
[3]Acetone	1000 ppm
[4]Methyl Cellosolve	25 ppm
[5]Methyl Ethyl Ketone	200 ppm
[6]Toluene	100 ppm

[1] Reference: The 1974 ACGIH TLV. The current Occupational Safety and Health Administration (OSHA) standard is 15 mg/M^3.

[2] Reference: The NIOSH 1974 criteria document. The current OSHA standard is $\frac{10}{\%SiO_2+2}$ mg/M^3

[3] Reference: The 1974 ACGIH TLV and the current OSHA standard.

[4] Reference: The 1974 ACGIH TLV and the current OSHA standard.

[5] Reference: The 1974 ACGIH TLV and the current OSHA standard.

[6] Reference: The NIOSH 1973 criteria document and the 1974 ACGIH TLV. The current OSHA standard is 200 ppm.

TLV's or standards for substances are established at levels designed to protect workers occupationally exposed on an 8-hour per day, 40-hour per week basis over a working lifetime. Because of wide variation in individual susceptibility, some workers may experience discomfort at or below the designated levels. Thus, an evaluation of the work place cannot be based entirely upon comparisons made against such TLV's or standards, as various TLV's and standards do not represent absolute protection of all workers.

E. Evaluation Results and Discussion

1. Q Machine

Fifty-one personal breathing zone samples were taken on employees in the area of the Q machine and analyzed for acetone, methyl ethyl ketone and methyl cellosolve. Acetone concentrations ranged from less than 5 ppm to 87 ppm and methyl ethyl ketone concentrations ranged from less than 1 ppm to 98 ppm. No methyl cellosolve was detected in any of the samples. (The detection limits for the solvents are 0.1 mg/tube for acetone, 0.01 mg/tube for methyl ethyl ketone and 0.1 mg/tube for methyl cellosolve). Four area samples were taken in the room beside the Q machine and six area samples were obtained beside the coating head. All solvent levels measured were low (<23 ppm). All sample locations and results are listed in Table 1. Therefore, based on the criteria outlined in Part D, it was determined that no solvent hazard existed.

Six area samples also were collected in the backwet area of Q machine. Acetone concentrations ranged from 97 ppm to 397 ppm and methyl ethyl ketone concentrations ranged from 213 ppm to 368 ppm. Again, no levels of methyl cellosolve were detected. It should be noted that these area sample concentrations are considerably higher than those obtained on the breathing zone samples and the levels for methyl ethyl ketone exceed the OSHA 200 ppm standard. It is known, based on work practices, that these concentrations are not normally encountered by employees except for short time periods. However, if employees do work in the backwet area for extended periods, proper protective equipment should be worn.

2. L Machine

Ten personal air samples were collected in the breathing zone of the coaters in the L machine area to determine their exposure to toluene. Several area samples also were collected at the coating head, windup area and mixing area. See Table 2 for results. The concentrations of toluene ranged from less than 7 ppm to 28 ppm on the personal samples and reached a maximum concentration of 44 ppm on the area samples. These values for toluene are below the level believed to cause adverse effects in workers.

3. Dye Kitchens and Ball Milling

Due to the large variety of substances that are used in the dye kitchens and ball milling area, numerous sampling and analysis procedures were performed. Personal breathing zone samples were collected and analyzed for toluene, methyl ethyl ketone and acetone. Maximum concentrations measured were 9 ppm for toluene, 51 ppm for methyl ethyl ketone and 134 ppm for acetone. Average concentrations were considerably lower. Area samples also showed low concentrations. Specific sample locations and concentration levels are given in Table 3.

Personal samples were obtained to determine the concentration of total particulate present. Of the samples collected, the maximum concentration measured was 1.79 mg/M^3. Due to the low levels of total particulates measured, samples were not analyzed for individual substances such as zinc oxide, zinc chloride and citric acid. It was known, based on total particulate concentrations, the results would show concentrations to be below levels believed to cause adverse effects for these substances.

Samples also were collected to determine total azo dye and total diazonium salt concentrations. No levels of azo dyes were detected on any of the samples. Of the six samples collected for diazonium salts, two contained detectable concentrations. Due to the different absorptivities of the salts which were present, concentrations are reported as a range. Concentrations of the two samples were 26-78 ug/M^3 and 91-281 ug/M^3. At the present time, little data are available on diazonium compounds. However, based on the low concentrations measured and available toxicological data, no health hazard appears to exist due to exposure to these substances.

Two samples were collected for determining respirable silica concentrations. The results show the silica content to be 50 ug/M^3 and 10 ug/M^3. Based on the NIOSH recommendation of 50 ug/M^3 and the variability in type and quantity of silica compounds used, a potential hazard may exist from exposure to silica. Employees should be informed of the potential hazards of silica and provided with the appropriate protective equipment.

4. Converting Departments

Thirteen personal breathing zone samples and four area samples were collected to measure total dust concentration in the converting departments. Sampling sites and concentrations are shown in Table 4. The highest concentration measured was 0.86 mg/M^3, with the average concentration being only 0.36 mg/M^3. The measured values are very low compared to the TLV of 10 mg/M^3 for nuisance particulates.

5. Felter's Building

Three samples were taken in the Felter's Building to measure silica exposure. The duration of sampling was limited due to the schedule of shipments which arrived during the time of the evaluation and the limited amount of work which was being performed. At the time of the evaluation only one shipment of a silica containing compound arrived. The shipment upon arrival at the warehouse was judged to be in good condition. Observation of the unloading and stacking process revealed that although the shipment was in good condition upon arrival, dust was produced during the unloading process. It appeared that a significant quantity of the dust produced was a result of poor housekeeping practices. The operation of fork trucks created dust in the air when operated in areas where dust had accumulated on the floors.

The results of the samples which were collected over a four hour period of time during which only one shipment of material containing silica was handled show the silica content to be 130 ug/M^3, 60 ug/M^3 and 110 ug/M^3. NIOSH recommends that occupational exposure should be controlled so that no worker is exposed to a concentration of free silica greater than 50 ug/M^3. Because of the variation of free silica content in the various silica containing compounds and the variability of the condition of the shipments, it was impossible to measure the concentrations considering all variables. However, based on the measurement made it is recommended that employees be informed of the hazards associated with silica and be supplied with and use protective equipment while working with any of these compounds. It is also recommended that better housekeeping practice be followed as a method for reducing dust exposures.

6. Medical

A. Analysis of nondirected questionnaires on two successive days revealed that the most common complaint among both the solvent-exposed group and the converters was dry throat and/or stuffed nose. The converters related these symptoms to dust and the solvent-exposed group related them to toluene and other solvents. Five out of eight converters and five out of nine solvent workers interviewed successively on these two days noted these symptoms. None reported symptoms consistent with solvent intoxication. Physical examinations in general were unremarkable with the exception of one person who worked in the converting area who gave a long history of asthma, who on the day of the NIOSH visit was symptomatic, and whose physical examination revealed wheezing. The asthmatic history did not appear to be related to or exacerbated by work or the work environment. One individual noted skin irritation which he related to zinc chloride.

Thirty-one (31) urine samples were collected: 16 on April 9 and 15 on April 10, 1975. Nine men who were normally exposed to a variety of solvents, including toluene, in the course of their work were selected as the "exposed" group. Eight men who work in the converting area where no solvents are used were selected as a control population. No effort was made to match for age or smoking habits but both groups were comparable in age and length of employment at GAF. The results have been tabulated and are shown in Table 6. The results of only 30 samples are present. One person's sample (sample L) was excluded since he was taking medication that might alter hippuric acid excretion.

The mean urinary hippuric acid excretion and the 95% confidence limits are reported in Table 6. The mean hippuric acid excretion for 9 April was 1.87± 1.43 gm/L and for 10 April was 1.72± 2.09 gm/L. These daily differences are not statistically different. The mean hippuric acid excretion for the solvent workers and the converters on the two test days did not vary significantly. It should be noted that the means for these two groups exceeds the upper limit of normal for urinary hippuric acid excretion reported in the literature.[3,4] A possible explanation is that all individuals imbibed coffee on the days of the study and one person drank cranberry juice. Another explanation is that the true range in variation of hippuric acid excretion is not clearly defined and that values for this group may be at the upper limit of normal. Such substances as aspirin and sodium benzoate (food preservatives) can cause an elevation in urinary hippuric excretion. Therefore isolated elevated hippuric acid excretion may not represent an occupational exposure. The mean hippuric acid excretion for solvent-exposed workers on 9 April was 2.04± 1.87 gm/L and that for the converters was 1.43± 0.79 mg/L. This difference between groups is statistically significant ($p < 0.0001$) but not very surprising since none of the converters were exposed. Only one solvent exposed worker had a distinctively elevated hippuric acid excretion which was 4.53 gm/L. This individual had one of the highest toluene exposures, 18.5 ppm. No correlation between the environmental level of toluene (range 0.5 - 19.5 ppm-TWA) and the excretion of hippuric acid could be established on the basis of the data from this study.

The interviews of the three men who worked at the Felter's Building were generally not remarkable. Recent chest X-rays on two of the three persons interviewed were unremarkable.

B. A review of the medical records of the twenty-three persons on the union list revealed the following illnesses:

Condition	Actual Number
Diabetes mellitus	1
Coronary heart disease	10
Arteriosclerosis	5
Cerebrovascular disease	2
Hypertensive disease	2
Gout	1
Varicose veins	1
Pulmonary fibrosis	1
Meniere's disease	1
Gastrointestinal disease	2
Chronic obstructive lung disease	3
Musculo-skeletal disease	2
Multiple sclerosis	2
Neuropsychiatric disease	2
Cirrhosis	1
Ulcerative colitis	1

As can be appreciated, coronary heart disease and arteriosclerosis represent the two largest categories. However, from these data one cannot calculate the incidence or prevalence of these illnesses.

A review of the medical records of the 242 currently active employees (excluding clerical personnel) revealed the following:

	Age Group			
	45-64		17-44	
Condition	Actual Number	Expected	Actual Number	Expected
Hypertensive Heart Disease	1	1.4-1.9	1	0.3
Coronary Heart Disease	9	3.8-5.6	0	-
Unspec. Disorder of Heart Rhythm	1	1.2-1.3	1	1.2
Cerebrovascular Diseases	1	0.7-1.5	0	-
Arteriosclerosis	2	0.1-0.2	0	-
Varicose Veins	4	3.9-6.7	1	2.7
Thrombophelebitis & Phelebitis	3	0.2-0.4	0	-
Hypertensive Disease NEC	4	11.9-13.7	4	4.1-4.6

The expected number for each condition in each age group is based on the data of the National Center for Health Statistics.[5]

While there is no firm conclusion which may be drawn from these data, the number of cases of coronary heart disease and arteriosclerosis do stand out from the numbers for other conditions. A chi-square analysis of the actual number of cases of coronary heart disease and the lowest expected number of cases shows a statistically significant difference (p=0.01) but compared to the higher expected number, there is no significant difference (p=0.20). Arteriosclerosis has a higher number of actual cases than expected. This difference is significant (p=0.004), but may be open to question because of the small number of observed cases (five) and expected cases (i.e. less than one) in this age group. The same statistical question applies to thrombophlebitis and phlebitis where the difference between actual number cases and the expected number is significant (p=0.001) but where the number of cases is small.

The statistical conclusion that may be drawn from this data is that while the actual number of cases of these three conditions is greater than expected for this population, this difference may not be truly statistically significant due to the limitations inherent in studying a cross-section of active employees. An in-depth retrospective mortality study would definitely indicate whether or not an excessive mortality from cardiovascular disease has occurred at GAF. It is recommended that NIOSH carry out such a study. It should be noted that at the present time there is no data in the literature to suggest that chronic low level exposure to organic solvents predisposes to cardiovascular diseases.

V. REFERENCES

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Table 1

Charcoal Tube Samples for Acetone, Methyl Ethyl Ketone and Methyl Cellosolve

Q Machine

GAF Office Systems Division
Johnson City, New York

April 9, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Acetone Concentration (ppm)	MEK Concentration (ppm)	Methyl Cellosolve Concentration (ppm)
lachine Tender	213	0732-1038	10.37	8.10	4.92	N.D.
	231	1038-1147	7.88	5.33	4.31	N.D.
	235	1343-1416	1.67	N.D.	14.3	N.D.
	204	0732-0759	1.37	N.D.	N.D.	N.D.
	208	0759-0829	1.34	N.D.	N.D.	N.D.
	217	0829-1105	7.05	11.9	4.82	N.D.
	221	1105-1130	1.12	N.D.	6.07	N.D.
let Back Area	220	1107-1127	0.95	397	368	N.D.
	223	1127-1148	1.11	113	413	N.D.
	225	1148-1208	0.86	97.7	213	N.D.
lork Desk Area	237	1352-1455	3.13	N.D.	14.1	N.D.
lead Coater	210	0720-1020	9.23	18.2	3.68	N.D.
	229	1020-1248	7.34	22.9	19.5	N.D.
	234	1248-1442	5.89	14.3	14.4	N.D.
	201	0720-0743	0.93	N.D.	N.D.	N.D.
	205	0743-0814	1.29	N.D.	5.27	N.D.
	209	0814-0838	0.96	87.5	3.54	N.D.
	214	0838-1048	5.23	24.1	11.7	N.D.
	222	1048-1132	1.77	N.D.	3.84	N.D.
	224	1132-1157	1.07	39.3	9.53	N.D.
	226	1157-1217	0.88	N.D.	N.D.	N.D.
	228	1217-1244	1.09	38.5	28.1	N.D.
lachine Tender	211	0724-1024	8.17	15.4	2.50	N.D.
	230	1024-1142	6.83	6.15	17.4	N.D.
	233	1340-1437	2.63	N.D.	98.3	N.D.
	202	0724-0747	1.22	N.D.	N.D.	N.D.
	206	0747-0819	1.49	N.D.	N.D.	N.D.
	215	0819-1058	7.92	21.2	4.29	N.D.
	218	1058-1122	1.19	N.D.	N.D.	N.D.
	232	1337-1412	1.79	N.D.	112	N.D.
Coater A	212	0728-1035	10.48	12.0	9.41	N.D.
	227	1035-1225	6.06	6.93	8.42	N.D.
	236	1312-1412	3.42	N.D.	9.91	N.D.
	203	0728-0752	1.15	N.D.	N.D.	N.D.
	207	0752-0825	1.49	N.D.	N.D.	N.D.
	216	0825-1101	7.08	5.93	4.80	N.D.
	219	1101-1125	1.03	N.D.	3.30	N.D.

Table 1 (contd)

GAF Office Systems Division
Johnson City, New York

April 10, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Acetone Concentration (ppm)	MEK Concentration (ppm)	Methyl Cellosolve Concentration (ppm)
ead Coater	240	0705-0942	6.01	20.9	11.3	N.D.
	255	0942-1212	7.15	11.8	12.4	N.D.
	265	1212-1359	5.36	15.7	11.4	N.D.
	247	1037-1054	0.80	N.D.	N.D.	N.D.
	258	1239-1301	1.16	36.2	23.5	N.D.
	261	1301-1314	0.63	N.D.	37.8	N.D.
oater A	242	0712-0955	8.53	4.92	8.77	N.D.
	252	0955-1125	4.81	8.73	13.4	N.D.
	264	1215-1356	5.57	7.54	9.77	N.D.
	250	1100-1125	1.33	N.D.	27.1	N.D.
	262	1245-1322	2.00	21.0	3.40	N.D.
achine Tender	243	0710-0958	8.89	9.45	3.83	N.D.
	253	0958-1125	4.75	17.7	2.15	N.D.
	266	1215-1402	5.96	7.05	1.71	N.D.
	251	1102-1125	1.11	N.D.	N.D.	N.D.
achine Tender	241	0712-0945	5.39	N.D.	0.63	N.D.
	256	0945-1220	4.59	N.D.	0.74	N.D.
	263	1220-1355	3.88	N.D.	0.88	N.D.
ork Desk Area	239	0705-0940	7.24	5.80	1.41	N.D.
	254	0940-1205	6.99	12.0	1.46	N.D.
	267	1205-1425	6.68	N.D.	2.55	N.D.
oater Area	244	1008-1028	1.10	N.D.	N.D.	N.D.
	245	1028-1048	1.10	N.D.	N.D.	N.D.
	248	1048-1118	1.82	23.1	N.D.	N.D.
	259	1230-1301	1.83	N.D.	1.86	N.D.
rea Dye Solution Container	260	1251-1311	0.98	14,014	114	N.D.
Back Wet Area	246	1025-1050	1.16	144	219	N.D.
	249	1050-1122	1.40	150	233	N.D.
	257	1225-1257	1.29	97.7	216	N.D.

Table 2

Charcoal Tube Samples for Toluene

L Machine

GAF Office Systems Division
Johnson City, New York

April 9-10, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Toluene (ppm)
Coater	401	0738-1030	9.11	18.1
	406	1030-1434	11.6	20.9
Coater A	402	0734-1028	11.6	7.1
	407	1028-1430	14.5	12.3
Area Beside Coating Head	403	0740-1037	10.5	20.5
	408	1037-1432	13.9	28.2
Area Beside Windup	404	0742-1032	13.9	18.7
	409	1032-1432	19.6	19.8
Area - Mixing	405	0744-1035	12.2	11.3
	410	1035-1434	13.3	27.6
Coater A	109	0712-0930	5.81	23.7
	115	0930-1150	6.69	21.8
	128	1150-1430	8.54	14.5
Coater	107	0712-0930	6.91	28.1
	120	0930-1150	8.07	12.0
	127	1150-1435	7.36	16.9
Area Beside Coating Head	108	0715-0930	7.00	44.4
	113	0930-1150	7.46	38.0
	125	1150-1300	3.38	31.9
	131	1303-1430	4.69	30.5
Area Beside Windup	111	0715-0930	6.48	35.8
	114	0930-1150	7.22	37.8
	126	1150-1430	8.20	28.0

Table 3

Samples for Dye Kitchen and Ball Milling

GAF Office Systems Division
Johnson City, New York

April 9-10, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Substance	Concentration
#2 Dye Kitchen Worker	101	0843-1433	525	Diazonium Salt	N.D.
	102	0843-1433	525	Azo Dye	N.D.
	161	0843-1433	595	Respirable Dust (14.2% SiO_2)	0.37 mg/M^3
	109	0726-1428	613	Diazonium Salt	N.D.
	111	0724-1428	606	Azo Dye	N.D.
	184	0724-1428	721	Respirable Dust (4.1% SiO_2)	0.26 mg/M^3
#2 Dye Kitchen Area	253	0845-1435	570	Total Particulates	0.49 mg/M^3
	270	0728-1345	565	Total Particulates	1.79 mg/M^3
#1 Dye Kitchen and Ball Mill Worker	105	0805-1443	597	Diazonium Salt	26.8-78.7 ug/M^3
	275	0805-1443	597	Total Particulates	0.97 mg/M^3
	107	0745-1440	622	Diazonium Salt	91.6-281 ug/M^3
	268	0745-1440	622	Total Particulates	0.79 mg/M^3
	110	0745-1440	622	Azo Dyes	N.D.
	103	0805-1012	6.44	Toluene	2.52 ppm
				Acetone	6.51 ppm
				MEK	1.06 ppm
	105	1013-1300	6.94	Toluene	9.34 ppm
				Acetone	N.D.
				MEK	0.98 ppm
	102	1300-1443	5.42	Toluene	6.97 ppm
				Acetone	N.D.
				MEK	6.29 ppm
	118	0945-1213	7.63	Toluene	2.83 ppm
				Acetone	N.D.
				MEK	1.78 ppm
	123	1213-1440	6.34	Toluene	7.24 ppm
				Acetone	N.D.
				MEK	2.68 ppm
#6 Dye Kitchen and Ball Mill Worker	103	0740-1438	537	Diazonium Salt	N.D.
	104	0740-1438	537	Azo Dye	N.D.
	254	0740-1438	627	Total Particulates	0.56 mg/M^3

Table 3 (contd)

GAF Office Systems Division
Johnson City, New York

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Substance	Concentration
	108	0800-1447	610	Diazonium Salt	N.D.
	112	0800-1447	610	Azo Dye	N.D.
	264	0800-1447	610	Total Particulates	0.52 mg/M^3
	101	0740-1021	7.25	Toluene	0.37 ppm
				Acetone	11.6 ppm
				MEK	51.6 ppm
	106	1020-1300	8.15	Toluene	0.66 ppm
				Acetone	134 ppm
				MEK	25.0 ppm
	110	0800-0942	5.04	Toluene	2.68 ppm
				Acetone	33.3 ppm
				MEK	20.9 ppm
	119	0942-1202	6.48	Toluene	0.83 ppm
				Acetone	N.D.
				MEK	45.6 ppm
	124	1202-1447	7.98	Toluene	1.35 ppm
				Acetone	69.5 ppm
				MEK	17.9 ppm
#6 Dye Kitchen Area	112	0800-0950	5.32	Toluene	N.D.
				Acetone	7.90 ppm
				MEK	12.1 ppm
	122	0950-1205	6.98	Toluene	N.D.
				Acetone	N.D.
				MEK	2.43 ppm
	130	1205-1450	8.74	Toluene	N.D.
				Acetone	9.61 ppm
				MEK	6.61 ppm
Ball Mill Area	117	0747-0940	5.48	Toluene	9.86 ppm
	121	0940-1200	6.87	Toluene	12.6 ppm
	129	1200-1444	8.61	Toluene	12.2 ppm
	248	0753-1440	610	Total Particulates	0.41 mg/M^3

Table 4

Filter Samples for Total Particulates

Converting Departments

GAF Office Systems Division
Johnson City, New York

April 9-10, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Total Particulate Concentration (mg/M^3)
Cutter	279	0758-1504	714	0.32
Cutter	251	0801-1510	729	0.52
Cutter	276	0805-1511	724	0.48
Power Sheeter Operator	249	0815-1505	697	0.14
Area by Power Sheeter	278	0818-1506	694	0.35
Area by Sheeter	281	0809-1514	722	0.80
Packaging Machine Operator	258	0823-1513	697	0.43
Cutter	262	0655-1436	784	0.32
Power Sheeter Operator	284	0702-1441	780	0.08
Area by Power Sheeter	285	0703-1442	780	0.26
Area by Sheeter	247	0658-1440	785	0.86
Packaging Machine Operator	246	0653-1438	790	0.70
Reroll Operator	266	0705-1437	768	0.25
Film Slitter (Clean Area)	274	0925-1500	553	0.42
Film Slitter (Clean Area)	289	0717-1431	738	0.00
Cutter (Clean Area)	257	0924-1453	534	0.13
Cutter (Clean Area)	277	0715-1447	768	0.14

Table 5

Silica Samples Taken in Felter's Building

GAF Office Systems Division
Johnson City, New York

April 10, 1975

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Silica Concentration (ug/M3)
Felter's Building Worker	173	0849-1305	435	130
Felter's Building Worker	83	0850-1308	440	60
Felter's Building Worker	171	0853-1310	437	110

Table 6

CORRECTED URINARY HIPPURIC ACID (g/l)

Subject	9 April 1975	10 April 1975
<u>Solvent Workers</u>		
A	2.70	4.53
B	2.58	2.16
C	2.21	1.52
D	0.85	0.98
E	3.31	3.06
F	1.79	1.00
G	2.05	-
H	1.85	2.28
I	1.38	1.22
J	-	1.17
<u>Converting</u>		
K	0.64	0.79
L		
M	0.95	0.88
N	2.08	2.08
O	2.32	2.24
P	1.55	-
Q	1.72	0.93
R	-	0.95
Mean for Day (95% confidence)	1.87 ± 1.43	1.72 ± 2.09
Mean Solvent Workers	2.08 ± 1.43	1.99 ± 2.32
Mean Converting	1.54 ± 1.27	1.31 ± 1.30