U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HE 80-12-734

James G. Biddle Company
Plymouth Meeting, Pennsylvania

August 1980

I. SUMMARY

On October 18, 1979, NIOSH received a request from the James G. Biddle Company, Plymouth Meeting, PA (SIC-3825) for a health hazard evaluation. The request alleged that employees were experiencing headaches as a result of exposure to dust generated by machine shop operations. An investigation by company and insurance personnel failed to identify the problem area.

A walk-through evaluation was conducted November 14, 1979. At that time private, non-directed medical interviews were conducted with the affected employees. An atmospheric evaluation for nuisance dust and lead dust and fume was conducted on January 23, 1980, followed by a medical evaluation for blood-lead on January 28, 1980.

The environmental air sampling done on January 23, 1980 showed that the nuisance dust level was 0.4 milligram per cubic meter of air sampled (mg/M^3) while the lead fume and dust levels ranged from less than the lower limit of detection (2 micrograms/sample to 14 micrograms per cubic meter of air sampled (ug/M^3).

Blood was drawn from 24 employees of the James G. Biddle Company. The criteria for blood-lead is that any value of lead above 40 micrograms per 100 milliliters (ug/100ml) considered above normal. The range found in the employees on January 28, 1980, was 6-18 ug of lead per 100 ml of whole blood.

On the basis of the data collected in this investigation, NIOSH determined that no hazard existed as a result of exposure to inert dust and lead at the time of our survey.

II. Introduction

Under the Occupational Safety and Health Act of 1970*, NIOSH investigates the toxic effects of substances found in the workplace. The James G. Biddle Company, Plymouth Meeting, PA requested such an investigation from NIOSH on October 18, 1979, to evaluate complaints of headaches in the machine shop area which were attributed to dust exposure. On November 14, 1979, NIOSH met with management and a representative of the employees for the opening and closing conferences, performed a walk-through survey and conducted non-directed medical interviews with sixteen employees. During this visit, the controls on two operations appeared questionable, viz. the cleaning of plates after sanding, with an air hose and the removal of excess lead on the combs. Environmental and blood samples were collected on January 23 and 28, 1980.

In November, 1979, an interim report containing the cumulative results of the non-directed medical interviews, recommendations that the practice of blowing off dust containing fibrous glass be discontinued and vacuum methods be used. Recommendations were also made concerning personal hygiene and eating habits in areas where lead was used.

III. Background

A. Plant Process/Conditions of Use

The machine shop occupies an area approximately 100 X 100 feet. The operations performed are typical of any small machine shop. Parts that are needed in quantity are subcontracted and only specialty parts are fabricated. The operations consist of abrasive finishing sanding, milling, lathing, grinding, tempering and soldering. The materials handled in the order of most use are aluminum, phenolic resins, brass, steel, fiberglass board and cast iron. Cutting oils are sporadically used as well as a chlorinated solvent for manual cleaning.

In one part of the shop there are two six-inch lead pots which are exhaust ventilated. Induction welding is also done in this area

Bench and machine cleaning were performed by blowing off with an air hose.

B. Medical

The James G. Biddle Company has no medical monitoring program. During the visit of November 14, 1979, non-directed medical interviews were conducted with 16 employees. No major health complaints were received.

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*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 and Human Services, 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.

IV. Evaluation Design

A. Environmental

Four personal dust samples were collected for lead in areas where this material was handled (See Table II). These samples were subsequently analyzed by NIOSH Method S-341[1].

Although cleaning of plates and table tops with air was replaced with vacuum methods, general air sample for inert total atmospheric dust that may contain fibrous glass was collected in the center of the machine shop. This sample was analyzed gravimetrically for total dust.

B. Medical

On January 28, 1980, a total of 24 workers (ten malesand 14 females) completed questionnaires (attached blank copy) and had blood drawn for lead determination. Their mean years worked at the James G. Biddle Company was 9.6 with a range of .25 years to 30 years. One individual detailed a past history of lead poisoning while in the military (in 1957). No lead toxicity symptoms were noted by any of the workers. There were no reports of job transfer or chelation therapy secondary to lead exposure, among these 24 workers.

V. Evaluation Criteria

A. Lead

(Refer to Table II for Environmental Standards)

Inhalation of lead dust and fumes is the major route of lead exposure in industry. A secondary source of exposure may be from ingestion of lead dust contamination on food, cigarettes or other objects. Once absorbed, lead is excreted from the body very slowly. The absorbed lead can damage the kidneys, peripheral and central nervous systems, and the blood forming organs (bone marrow). These effects may be felt as weakness, tiredness, irritability, digestive distrubances, high blood pressure, kidney damage, mental deficiency, or slowed reaction times. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women.

Blood levels below 40 ug/100 ml whole blood are considered to be normal levels which may result from daily environmental exposure.

However, fetal damage in pregnant women may occur at blood levels as low as 30 ug/100 ml. Lead levels between 40-60 ug/100 ml in lead exposed workers indicate excessive absorption of lead and may result in some adverse health effects. Levels of 60 to 100 ub/100 ml represent unacceptable elevations which may cause serious adverse health effects. Levels over 100 ug/100 ml are considered dangerous and often require hospitalization and medical treatment.

The new OSHA standard for lead in air is 50 ug/M^3 on an eight-hour time-weighted average for daily exposure. The standard also dictates that in four years workers with blood lead levels greater than 50 ug/100 ml must be immediately removed from further lead exposure and in some circumstances workers with lead levels less than 50 ug/100 ml must also be removed. At present medical removal of workers is necessary at blood lead levels of 70 or greater. Removed workers have protection for wage, benefits, and seniority for up to eighteen months until their blood levels adequately decline and they can return to lead exposure areas.

B. Inert Dust[2]

In contrast to fibrogenic dusts which cause scar tissue to be formed in lungs when inhaled in excessive amounts, so-called "nuisance" dusts have a long history of little adverse effect on lungs and do not produce significant organic disease or toxic effect when exposures are kept under reasonable control. The nuisance aerosols have also been called biologically "inert", but the latter term is inappropriate to the extent that there is no particulate which does not evoke some cellular response in the lung inhaled in sufficient amounts. However, the lung-tissue reaction caused by inhalation of nuisance aerosols has the following characteristics:

1. The architecture of the air spaces remains intact.
2. Collagen (scar tissue) is not formed to a significant extent.
3. The tissue reaction is potentially reversible.

Excessive concentrations of nuisance aerosols in the workroom air may seriously reduce visibility (iron oxide), may cause unpleasant deposits in the eyes, ears and nasal passages (Portland Cement dust), or cause injury to the skin or mucous membranes by chemical or mechanical action per se or by rigorous skin cleansing procedures necessary for their removal.

VI. Results and Discussions

A. Environmental

Results of the eight-hour time-weighted average personal samples were well within the prescribed standards for lead. The results of the air sampling is presented in Table II.

Air concentrations of nuisance dust in the work atmosphere were minimal and well within the recommended environmental limits, (See Table I).

B. Medical

The blood-lead determinations were all found to be within normal range. Normal values for lead in blood are less than 40 ug Pb/100 ml of whole blood. The results ranged from 6 to 18 ug/100 ml. (See Table III).

During the visit to James G. Biddle Company November 14, 1979, the method of cleaning parts, machinery and table tops was with an air hose. At the closing conference, it was suggested that vacuum methods be used as this would be conducive to better housekeeping in preventing dust from settling in other areas. Vacuum cleaning is now the accepted method of cleaning.

The nuisance dust level was 0.4 mg/M^3 which was below the criteria level of 10 mg/M^3. This method of cleaning also abated the complaints from employees.

Lead dust and fume levels ranged from less than the lower level of detection 2 ugs/sample to 14 ugs/M^3.

It was noted that food was dispensed and cigarette smoking was permitted in the areas where lead was applied to the comb and where excess lead is filed off. This practice was discontinued when it was brought to the attention of management and now is done in designated areas and personal hygiene is encouraged.

VII. Recommendation

Establish a housekeeping program in areas where lead is applied or filed. Cleaning should be performed by wet vacuum methods.

No recommendations are made concerning nuisance dust which may contain fibrous dust generated during sanding and grinding operations. Previously this dust was cleaned from the parts and work tables by air hose. The James G. Biddle Company has purchased vacuum cleaners and employees have been instructed that this is the acceptable method.

The control measure taken to abate lead absorption through changes in personal hygiene habits and changing the smoking and eating areas appear adequate.

VIII. Authorship and Acknowledgements

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Acknowledgements

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IX. Distribution and Availability

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, OH 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, VA. Information regarding its availability through NITS can be obtained from NIOSH, Publications Office at the Cincinnati address.
Copies of this report have been sent to:

1. James G. Biddle Company, Plymouth Meeting, PA
2. Employee Representative
3. NIOSH, Region III
4. OSHA, Region III

For the purpose of informing the 20 employees of the results of the James G. Biddle Company survey, the employer shall promptly "post" for a period of 30-calendar-days the Determination Report in a prominent place(s) near where employees work.

X. REFERENCES

1. NIOSH Manual of Analytical Methods, Second Edition, Volume 3, DHHS, PHS, CDC, NIOSH, April 1977.

2. Documentation of the Threshold Limit Values for Substances in Workroom Air - with Supplements, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, Third Edition, 1971.

Table I
James G. Biddle Company
Plymouth Meeting, Pennsylvania
January 25, 1980
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Airborne Concentration of Inert Dust in the Work Atmosphere

Location	Inert Dust*	Sampling Period	Remarks
Center of Machine Shop	0.4	8:55 - 14:15	General Air

* - denotes milligram of contaminant per cubic meter of air sampled.

Applicable Criteria

1. Occupational Health Standard promulgated by U.S. Department of Labor, OSHA 2206, Revised November 7, 1978, Part 1910, Title 29 of the Code of Federal Regulations Section 1000, the inert dust standard is 15 milligrams per cubic meter of air.

2. Threshold Limit Values for Chemical Substances for 1979 as promulgated by the American Conference of Governmental Industrial Hygienists (ACGIH) for inert dust is 10 milligrams per cubic meter of air.

Table II
James G. Biddle Company
Plymouth Meeting, Pennsylvania
January 25, 1980
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Airborne Concentrations of Lead Dust and Fume Measured at the Breathing Zone

Sample Number	Operation	Lead*	Sampling Period
1	Leading (L.G)	14	8:20 - 16:10
2	Induction Welding (N.G)	6	8:25 - 16:10
3	Balancing (P.M)	< 2	8:45 - 16:00
4	Soldering (M.F)	< 2	8:50 - 16:15

* - denotes micrograms of lead per cubic meter of air sampled.
< - denotes less than.

Lower Limit of Detection was 2 micrograms of lead/sample.

Lead Evaluation Criteria

OSHA (Effective 2/1/79) 50 $\mu g/M^3_3$

TABLE III

BLOOD LEAD VALUES

James Biddle Company
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Sample No.	Blood Lead ug/100 ml. whole blood
001	11
002	8
003	14
004	10
005	11
006	18
007	18
008	15
009	16
010	13
011	14
012	18
013	13
014	11
015	7
016	9
017	10
018	7
019	10
020	6
021	10
022	18
023	8
024	8

Any value above 40 ug Pb/100 ml of whole blood is considered above normal.

QUESTIONNAIRE

HHE 80-12

James G. Biddle Company
Plymouth Meeting, Pennsylvania

DATE _____

1. NAME _____

JOB TITLE _____ SENIORITY DATE _____

WORK DUTIES _____

SHIFT _____

ADDRESS _____

AGE _____ SEX _____ PHONE _____

SMOKE? _____ (PACK YEARS)

2. OCCUPATIONAL WORK HISTORY (reverse chronology)

CURRENT JOB _____ HOW LONG _____

_____

PAST JOBS _____ HOW LONG _____

_____ _____

_____ _____

_____ _____

3. HAVE YOU EVER BEEN TREATED FOR Pb POISONING OR ANEMIA ("LOW BLOOD")?

YES _____ NO _____ IF YES:

DATE	DOCTOR	HOSPITAL	TYPE R_x & HOW LONG

4. HAVE YOU EVER BEEN TRANSFERRED TO A DIFFERENT JOB BECAUSE OF ↑ BLOOD Pb?

YES _____ NO _____

5. HAVE YOU EVER BEEN TREATED/STUDIED FOR KIDNEY PROBLEMS?

YES _____ NO _____

6. DO YOU HAVE ANY HOBBIES OR OTHER ACTIVITIES THAT WOULD EXPOSE YOU TO Pb (FLUX & SOLDER, BULLETS, ETC.)?

YES _____ NO _____

IF YES: EXPOUND _____

_____

_____

7. HAVE YOU DRUNK "MOONSHINE" IN THE PAST 3 MOS.? YES _____ NO _____

8. DO YOU USE ANY HANDMADE/FOREIGN-MADE POTTERY FOR FOOD OR BEVERAGE USE?

YES _____ NO _____

9. HAVE YOU EVER TAKEN ANY PILLS TO PREVENT Pb POISONING OR TO TREAT "MILD" OR "SLIGHT" Pb POISONING? YES _____ NO _____

HOW MANY TREATMENTS? _____

WHEN WAS LAST R_x? _____

WHO GAVE YOU PILLS? COMPANY DOCTOR _____

OTHER DOCTOR _____

OTHER PERSON _____

10. DO YOU HAVE ANY HEALTH PROBLEMS WHICH YOU THINK ARE RELATED TO YOUR JOB?

YES _____ NO _____

IF YES: EXPOUND _____

_____

_____

_____