HEALTH HAZARD EVALUATION REPORT 72-105-56
HAZARD EVALUATION SERVICES BRANCH
DIVISION OF TECHNICAL SERVICES

Establishment	:	Modern Metal Products Loves Park, Illinois
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JULY 1973

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

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HEALTH HAZARD EVALUATION REPORT 72-105
MODERN METAL PRODUCTS
LOVES PARK, ILLINOIS

JULY 1973

I. SUMMARY DETERMINATION

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 any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees regarding exposures to carbon monoxide and welding fumes at Modern Metal Products, Loves Parks, Illinois.

NIOSH investigators conducted an evaluation of this facility on January 19 and March 21, 1973. Medical interviews were conducted with the employees in the area of the arc welding, spot welding, and metal punch-press operations, and environmental samples were collected for carbon monoxide, carbon dioxide, nitrogen dioxide, and sulfur dioxide.

The occupational health standards as promulgated by the U. S. Department of Labor (Federal Register, Part II, § 1910.93, Table G-1) applicable to the substances of this investigation are:

Substance	Federal Standard
Carbon Monoxide	50 ppm*
Carbon Dioxide	5000 ppm
Nitrogen Dioxide	5 ppm
Sulfur Dioxide	5 ppm

* ppm - Parts of vapor or gas per million parts of contaminated air by volume at 25° C. and 760 mm Hg pressure.

An employee's exposure to the substances listed above, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average for that substance.

Arc Welding Operations

It was determined that subsequent to the time the initial request was submitted to NIOSH and our initial field investigation, local exhaust ventilation has been installed at the arc welders stations. Two of the three arc welders stated that prior to installation of local ventilation they had experienced upper respiratory irritation and occasional headaches from the arc welding fumes. All arc welders denied current symptoms and were quite content with present ventilation. Measurements showed adequate ventilation had been provided and no further investigation was conducted.

Spot Welding Operations

Five spot welders were interviewed, all of whom have worked from three months to one year at their present job. Only one worker noted occasional irritation to his eyes and throat from spot welding fumes resulting basically from welding on oily parts. There is no local ventilation present in this work area.

Punch-Press Operations

The major concern of press operators was with the intermittent symptoms developing when tow motors deliver material to their work site.

Ten press operators were interviewed to ascertain symptomatology associated with exposure to potentially toxic gases in the work place. Three workers denied any symptoms even after direct questioning regarding headaches, fatigue, dizziness, nausea, and objectionable odor. The remaining seven reported objectionable odor and slight nausea from tow motors exhaust. Two noted mild eye and throat irritation and three reported mild headaches.

Environmental samples for carbon monoxide ranged between 10-30 ppm in all of the aformentioned work places during both visits to the plant. Additionally, nitrogen dioxide, carbon dioxide and sulfur dioxide was not detected on either occasion.

Based upon the results of the environmental and medical evaluation above, it is our determination that the substances (carbon monoxide, carbon dioxide, nitrogen dioxide and sulfur dioxide) are not toxic at the concentrations found or used in the arc welding, spot welding, and punch-press operations.

Although environmental samples collected during two plant visits indicated levels of carbon monoxide, nitrogen dioxide, carbon dioxide or sulfur dioxide to be below current Federal Standards, the fact that workers were symptomatic in the past when tow motor exhaust is present near work stations indicates that a potential health hazard may exist under such conditions. Recommendations have been offered to reduce the potential hazard.

Copies of this Summary Determination of the evaluation are available upon request from the Hazard Evaluation Services Branch, NIOSH, U. S. Post Office Building, Room 508, Fifth and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

a) Modern Metal Products, Loves Park, Illinois

b) Authorized Representative of Employees

c) U. S. Department of Labor - Region V

For purposes of informing the approximately 40 "affected employees" who work in the area of the evaluation, the employer will promptly "post" the Summary Determination in a prominent place(s) near where affected employees work for a period of 30 calendar days.

II. 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 any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees regarding exposures to carbon monoxide and welding fumes at Modern Metal Products, Loves Park, Illinois.

III. BACKGROUND HAZARD INFORMATION

A. Background Hazard Information

The occupational health standards as promulgated by the U. S. Department of Labor (Federal Register, Part II, § 1910.93, Table G-1) applicable to the substances of this investigation are:

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B. Welding Fumes

The potential harm from gases and fumes generated during a welding operation depends upon the types of material involved and the temperature of the welding operation. The actual concentration of the chemical contaminant in the workers' breathing zone and the length of exposure are also of significance.

The more important air contaminants which may be considered are ozone, oxides of nitrogen, carbon dioxide, carbon monoxide and the various constitutents of the rod, rod coating and the metals themselves. Ozone is an extremely irritating gas to inhale; and oxides of nitrogen which have objectionable, somewhat nauseating odors may also lead to an increase in the breathing rate but if adequate oxygen concentrations are present no serious effects will arise.[1]

Various metals upon volatilization form oxides which may be inhaled and the fumes from copper, zinc, and other metals are known to produce metal fume fever, a short-lived, influenza-like syndrome, which although self-limiting, and usually without sequelae, is quite objectionable.

Sulfur Dioxide (SO_2)

The acute effects of sulfur dioxide usually are irritation to eyes and mucous membranes in general, including the upper respiratory tract.[2]

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless, and tasteless gas principally encountered as a product of incomplete combustion of carbonaceous materials. Its best understood biologic effect is its affinity for hemoglobin (Hb), which is 210 times greater than oxygen, making less Hb available to comine with O_2. CO combines less rapidly with Hb than does oxygen, but produces a stronger bond.

The Federal Standard of 50 ppm was arrived at considering that levels up to 50 ppm will prevent blood levels of COHb in excess of 10% "a level that is just below the development of signs of borderline effects."[3]

Oxides of Nitrogen

From a practical standpoint only nitrogen dioxide needs consideration since the principal gases contributing to the toxicity of "nitrous fumes" are nitric oxide and nitrogen dioxide, and nitrogen dioxide is 4-5 times as toxic as nitric oxide. Nitric oxide is oxidized in the air to nitrogen dioxide and so for practical purposes its toxicity need not be given special attention because the resulting nitrogen dioxide is much more insidious.[4]

Nitrogen dioxide has a characteristic disagreeable odor and may be noted at concentrations as low as 5 ppm. In concentrations of 10-20 ppm the gas is mildly irritating to the eyes, nose and upper respiratory mucosa. However, men have been observed to tolerate without significant health effects 5-30 ppm for periods up to 18 months. Concentrations considered dangerous for short exposures, i.e. above 50 ppm, are only

moderately irritating to the eyes, nasal passages.

IV. HEALTH HAZARD EVALUATION

A. Observational Survey

The observational survey of Modern Metal Products was made on January 19, 1973, by the National Institute for Occupational Safety and Health (NIOSH) representatives, Mr. Richard S. Kramkowski and Dr. Steven K. Shama. The purpose of our visit was explained to [redacted] Vice-President, Manufacturing, and we proceeded to the manufacturing area where we met the requestor, [redacted] and [redacted] accompanied us to the area of the alleged hazards.

The plant employs about 190 people in the work areas - two shifts per day and the major activity is metal stamping for automotive accessories such as hood and trunk latches and accelerator linkages.

Plant Process - Condition of Use

Approximately twenty people are employed per shift in the area of the evaluation operating arc welding, spot welding and punch press machines. Ms. Ames, and the welders, indicated that local exhaust had recently been installed at arc welding stations and that there was no longer an apparent problem. The welding machines had been moved from a different location last year and local exhaust was absent for a period while new duct work and equipment was acquired and installed. There are four arc welding machines, locally exhausted, and six fusion welding machines, with no local exhaust.

Carbon monoxide emanates from eight propane operated fork lift trucks which are constantly moving materials throughout the plant. Conditions, as expected, are reportedly worse in the winter than at other times of the year when doors and windows are open. There is no power driven exhaust ventilation in the plant. Tempered make up air is located in other portions of the plant, but not in the area of concern to this evaluation. The company anticipates installation of another unit.

B. Environmental Evaluation

Environmental samples were collected on January 19, 1973, and again on March 21, 1973. Samples for carbon monoxide, nitrogen dioxide, sulfur dioxide, and carbon dioxide were collected during both visits using Drager detector tubes and a Drager pump. On March 21, 1973,

a MSA carbon monoxide indicator in conjunction with a continuous recorder was utilized to constantly monitor CO concentrations in the work areas.

The average concentration of CO measured on twenty occasions using detector tubes (ten samples each visit) was 25 part per millipn (ppm) with a range from 10 to 30 ppm. The results of the continuous monitoring is shown in Attachment I. The maximum level of CO indicated on the chart is approximately 30 ppm.

Three samples each for nitrogen dioxide, sulfur dioxide, and carbon dioxide were non-detectable as measured by the Drager detector tubes. The minimum detectable concentrations for the Drager detector tubes are: nitrogen dioxide - 2ppm, sulfur dioxide - 1 ppm, and carbon dioxide - 1000 ppm.

The local exhaust ventilation system at the arc welding machines was evaluated using a Kitagawa Air Flow Indicator and an Alnor Jr. velometer. Capture of the smoke emitted from the air flow indicator appeared to be very good, and face velocity measurements using the velometer exceeded 800 feet per minute, the upper limit of the instrument.

C. Medical Evaluation

1. Health Capabilities:

There is a first aid room open on both shifts. The day shift is covered by a full time certified first-aid trained employee, the second shift is covered by a first-aid trained employee full time for one-third of the shift and on-call for the remainder of the shift. Any emergencies are taken to the Rockford Clinic, Rockford, Illinois.

There are no pre-employment or routine physical exams done; however, a physician's medical release for return to work is required in the case of hospitalization, or significant injury or illness.

Over the last 8-10 months the company has instituted a hearing conservation program. The company's insurance carrier, Liberty Mutual, conducted a noise survey which indicated the need for a hearing conservation program. Ear plugs have been ordered and audiometric equipment is to be installed. The testing will be performed by personnel certified in audiometric testing.

2. Employee Interviews:

Two of the three arc welders stated that prior to installation of local ventilation they had upper respiratory irritation and occasional

headaches from the arc welding fumes. They noted that the situation without local ventilation was a temporary one since they had just been moved to the present location in the plant and the duct work for the exhaust had not been installed. However, all three arc welders denied any present symptoms and were quite content with present ventilation.

There were five spot welders who were interviewed, all of whom have been employed from three months to one year at their present job. Only one worker noted irritation to his eyes and throat occasionally from the spot welding fumes. There is no present local ventilation in his area.

With regard to the press operators, it appeared that their major concern was with the intermittent symptoms which develop when tow motors deliver material to their work site and remain stationary for a few minutes with their engines idling.

All ten press operators were interviewed regarding typical symptoms from CO or oxides of nitrogen. Three workers denied any symptoms even after direct questioning regarding headaches, fatigue, dizziness, nausea, objectionable odor, etc.

The remaining seven reported objectionable odor and slight nausea from the tow motor exhaust. Two noted mild eye and throat irritation and three reported mild headaches.

It is noted that these symptoms are not present everyday. However, most of the press operators do note that symptoms begin shortly after a tow motor idles nearby.

These interviews were verified during the environmental survey of March 21, 1973, utilizing a medical questionnaire (Attachment II).

D. Conclusions and Recommendations

Medical interviews with arc welders suggest no hazardous condition existed at the time of the evaluation. Spot welders in general also appear to be working without definitive hazards related to spot welding. Occasionally, mild irritation may occur and additional local ventilation could reduce the potential hazard, especially to such symptomatic workers.

Punch press operators appear to be affected by the objectionable odor and irritating quantities of the oxides of nitrogen and may be experiencing the effects of periodic, short-term over-exposure to CO. In addition, workers may be exposed to various combustion products (primarily sulfur compounds) from commercial propane which may be the cause of their intermittent symptoms.

Air samples taken on the days of the investigation when workers were not symptomatic indicated negligeable levels of nitrogen dioxide, carbon dioxide, sulfur dioxide, and carbon monoxide levels between 10-30 ppm. It is the recommendation that efforts be made to minimize the potential for occasional excessive exposure to employees. It is understood that additional ventilation is planned for the entire area of concern, and it is recommended that this be pursued. Also, tow motor operation should be restricted to short stays near work stations and tow motors should be routinely maintained with poorly functioning units being removed from service until repaired.

However, considering the past symptoms consistant with short term overexposure to the various combustion products of propane fuel in tow motors (e.g. carbon monoxide, nitrogen dioxide, and sulfur compounds) a hazard from such exhaust may have existed in the past.

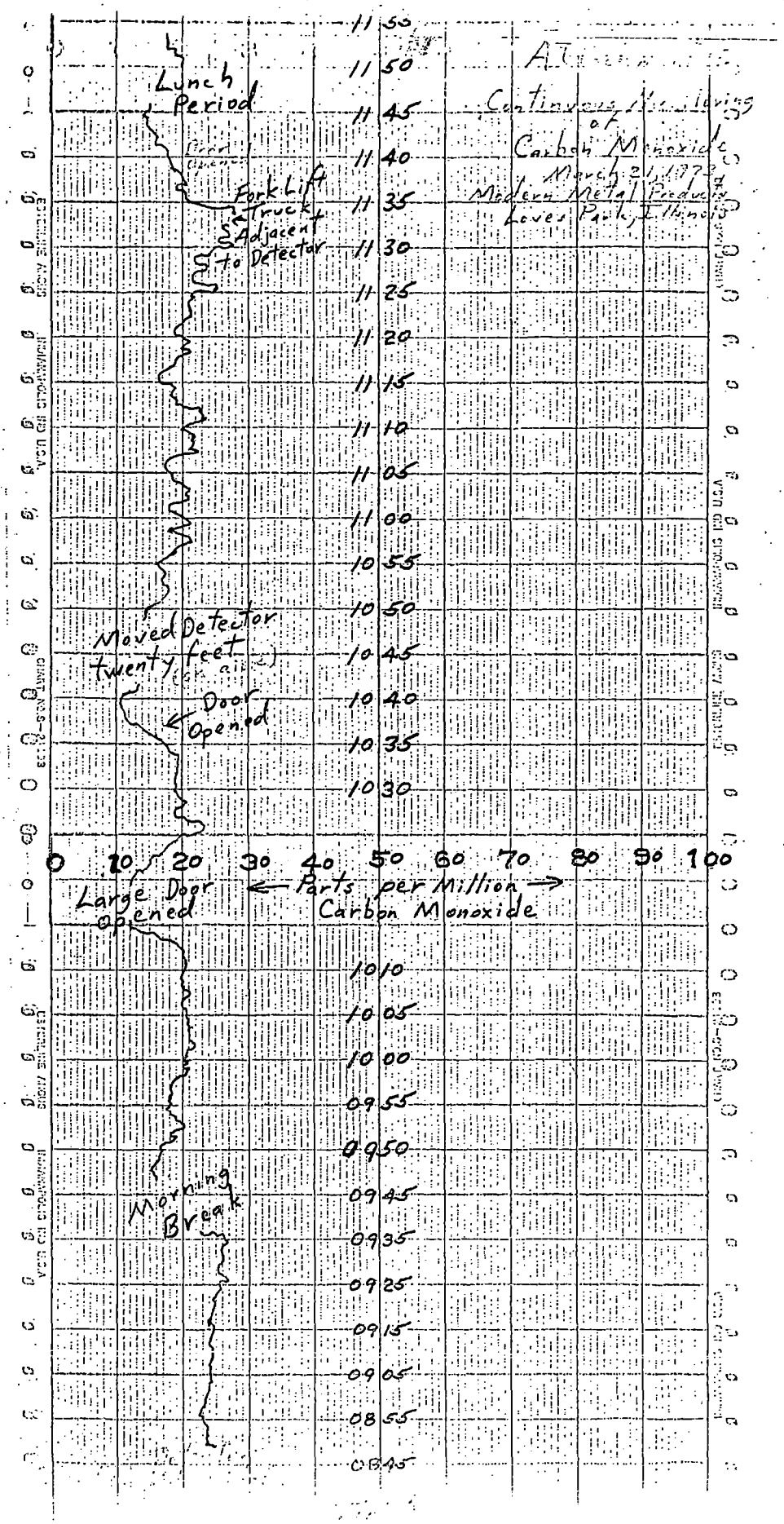
V. REFERENCES

1. Documentation of the Threshold Limit Value for Substances in Workroom Air. American Conference of Governmental Industrial Hygienist, 3rd ed., 1971.

2. Patty, F. Industrial Hygiene and Toxicology, 2nd ed., Volume II, Interscience Publishers, N. Y., 1963, page 894.

3. TLV Document.

4. Patty, page 918-922.


Continuous Recording of Carbon Monoxide
March 21, 1973
Modern Metal Products
Lewes Park, Illinois
Lunch Period
Fork Lift Truck Adjacent to Detector
Moved Detector twenty feet
Door Opened
Large Door opened
Morning Break
0 10 20 30 40 50 60 70 80 90 100
← Parts per Million →
Carbon Monoxide
11 50
11 45
11 40
11 35
11 30
11 25
11 20
11 15
11 10
11 05
11 00
10 55
10 50
10 45
10 40
10 35
10 30
10 10
10 05
10 00
09 55
09 50
09 45
09 35
09 25
09 15
09 05
08 55
08 45

ATTACHMENT II

MODERN METAL, LOVES PARK, ILLINOIS

MEDICAL QUESTIONNAIRE

(For Public Health Service Confidential Use Only)

NAME_____

JOB DESCRIPTION_____

Has anything bothered you today while working which you feel may be related to your job?

Have you had any of the following problems today?

	In General	Only while or soon after tow motors idling nearby
Eye irritation-burning, tearing		
Nose irritation-burning		
Throat irritation-dry, scratchy		
Chest irritation-coughing		
Headaches		
Dizziness or floating feeling in your head		
Nauseous feeling in stomach		

Do you smoke? Yes No

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