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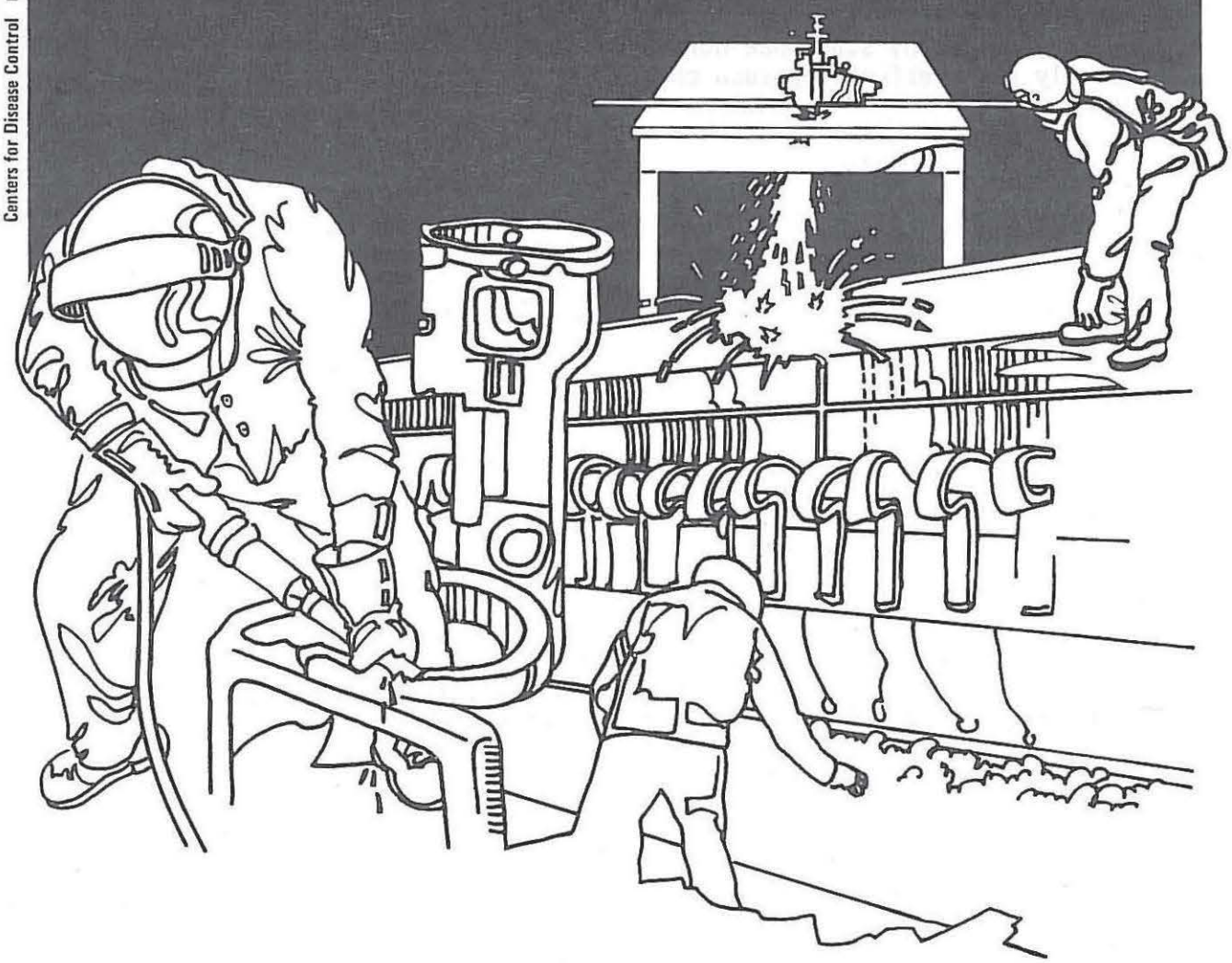

Health Hazard Evaluation Report

HE 80-214-799
M&B METAL PRODUCTS, INC.
LEEDS, ALABAMA

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. 699(a)(6), which authorizes the Secretary of Health and Human Services, following a written request from 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.

HE 80-214-799
January 1981
M&B Metal Products, Inc.
Leeds, Alabama

NIOSH INVESTIGATORS:
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I. SUMMARY

On July 24, 1980, a request for health hazard evaluation was received from a representative of Local 543, United Cement, Lime, and Gypsum Workers, M&B Metal Products, Incorporated, Leeds, Alabama. Suspected exposures were airborne undyed and Direct Blue dyed cellulose flock and vapors from epoxy adhesive. Accordingly, a medical officer and industrial hygienist from the National Institute for Occupational Safety and Health (NIOSH) evaluated the site during September 22 and 23, 1980.

M&B Metal Products, Incorporated manufactures many types of wire hangers. The process in question fabricates hangers which have the bottom strut coated with a viscose rayon flock. This flock prevents trousers from slipping off the hanger.

Work practices in the area of the three flocking machines were observed. Ventilation measurements were performed. The mechanical integrity of the machines was evaluated. The medical officer interviewed employees for evidence of work-related symptoms.

Employees reported throat discomfort, nasal congestion, and mild cough after two or three consecutive days of respiratory exposure to Direct Blue dyed rayon flock. The symptoms described were consistent with irritation but did not indicate disease of the pharynx or respiratory tree. These symptoms were reported not to occur when proper functioning of machinery and good work practices minimized exposure to airborne flock. The dyes involved have not undergone full toxicological testing but have shown no serious toxic effects in screening tests.

Once a properly functioning flock dislodging device was put into operation, manual tamping, which generated the preponderance of the airborne flock, became unnecessary. Since the exposure situation was eliminated by this correction, no environmental sampling was performed. Ventilation measurements were made to assess the existing exhaust system. The system was adequate in controlling fugitive flock.

Based on the results of our evaluation, no health hazard was found at M&B Metal Products, Incorporated. Suggestions for improvements that would reduce the potential for pharyngeal and respiratory tree irritation include modification of the primary flock exhaust, replacement and adequate maintenance of excess flock dislodging accessories, scheduled vacuum cleaning of the floors in the work area, and wearing of a simple dust mask for the few minutes per day when bulk flocking material is loaded into the machine's reservoir.

KEYWORDS: (SIC 3480). Rayon flock, Direct dye, respiratory irritation.

II. INTRODUCTION

On July 24, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request from a representative of Local 543, United Cement, Lime, and Gypsum Workers, Leeds, Alabama to ascertain potential health hazards associated with the flocking operation at M&B Metal Products, Inc. Suspected hazards were exposure to airborne rayon flock and epoxy adhesive. A NIOSH investigation team evaluated the situation during September 22-23, 1980.

III. BACKGROUND

M&B Metal Products, Inc., produces standard wire coat hangers, standard wire hangers with paper facing, and hangers having a stiff paper tube as the bottom cross-strut. In addition, it produces standard wire hangers that have a raised rough coating of rayon flock applied to the bottom cross piece so that trousers will not slip off.

For production of standard wire hangers, wire is drawn to the required 5/32" (39.7mm) diameter, cleaned, and cut to length. Custom-made machines then bend the wire around jigs into the familiar hanger conformation.

For production of flocked wire hangers, the cut, unbent wire pieces first are loaded into a hopper which feeds onto two continuous screws. These screws are on each side of the machine and revolve to transport the wires through the process. Wires are brought through a dip of epoxy adhesive which coats the central portion. About four inches later in the traverse, an overhead swinging arm pneumatically sprays flock on the wire. An exhaust is located immediately beneath the swing width of the arm. The coated wires travel beneath a bank of infra-red lamps which dry the adhesive before coming to a beater which dislodges any loose flock. There is a slot-type exhaust beneath this station. Finally, cam actuated arms perform the sundry bends and twists around jigs to shape the wire into the familiar coat hanger conformation.

A typical binary (A and B) epoxy is used to adhere the flock to the wire.

Flock is loaded manually into the pneumatic reservoir by hand from bulk bags.

Flock is made by treating cellulose with alkali and carbon disulfide. This cellulosic is then extruded through small holes to make viscose rayon. It is naturally white in color and chemically inert. Particle size is too large to be respirable. White (undyed) and blue-dyed flock are used at M&B on the hangers.

The blue dyes used to color this flocking material are Direct Blue 80 and Direct Blue 106. These dyes go by the trade names of Intralite Blue 2RLL(80) and Intralite Brilliant Blue 2GLL(106), among others.*

*Manufactured by Crompton and Knowles, Corporation, Reading, Pa., and several others.

Direct dyes (1) were originally designed and marketed for the purpose of dyeing cotton. They provide the simplest means of coloring cellulosic materials. Direct Blue 106 is a dioxazine dye that is a bright blue color. Its structure is known, and a color index number has been assigned (51300). Direct Blue 80 is a metallized diazo dye with a non-specified chemical structure. It is especially useful in covering irregularly-dyed viscose. These dyes are soluble in water at 25g/l for Direct Blue 80 and 20g/l for Direct Blue 106.

Direct dyes are not extremely "fast". Fastness is the ability of a dye to remain bound to its intended substrate, such as cellulose fibers. An example of this concept would be the fading of denim "blue jeans" which have been colored with Direct Blue dyes. Repeated washings inevitably leach or solubilize amounts of dye. Very little dye comes off the fibers at any one time.

Direct Blue 80 is of the diazo class, but it is not a derivative of benzidine. There is no published toxicological data for Direct Blue 80. The dye manufacturer provided its own toxicity data, but without identifying the laboratory that did the testing. Direct Blue 80 did not produce eye irritation in rabbits. Is not a skin irritant when applied repeatedly to the intact and abraded skin of rabbits. The acute lethal dose for rats was estimated estimated at 7.1 gm/kg, which is in the "practically non-toxic" range. It was also found to be non-toxic in an acute dust inhalation test in rats. Only a small munber of animals was tested for each of these estimates of the safety of Direct Blue 80. There is no data for chronic exposure or long-term effects.

No toxicity data were available for Direct Blue 106. It is not thought by its manufacturer to possess any highly unusual or untoward toxicities.

IV. METHODS AND MATERIALS

Ventilation measurements were made using a Kurz air-flow meter. No other environmental measurements were made.

Employees interviewed included two who specifically had worked at the flocking apparatus.

V. EVALUATION CRITERIA

Rayon flock is considered to be a non-respirable nuisance dust. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a level of 10 mg/M^3 or 30 million particles per cubic foot (MPPCF) (2). Acute and dermal toxicities for Direct Blue 80 were used as a guide to estimate the potential health hazard of the dyes (3).

VI. RESULTS

Individuals who work or have worked in the area where flock is applied to coat hangers reported throat discomfort, nasal congestion, and mild cough that become noticeable after two or three consecutive days of respiratory exposure

to the blue-dyed rayon material. These symptoms were reported not to arise when the amount of airborne flock was minimized by optimal functioning of the machinery and when respiratory protection was worn during the loading of bulk flock into the machine's reservoir. Exposure to the white (undyed) rayon flock was reported to cause nasal congestion but less throat irritation. Comparable descriptions of symptoms were obtained from both an individual who smoked and one who did not. Symptoms were reported to resolve after a day or two away from perceived exposure.

The machine operator was observed to tamp the hangers manually in order to remove excess flock before putting the hangers into shipping boxes when the mechanical tamper was not in operation. This tamping caused flock to become airborne within the breathing zone of the operator.

A properly functioning flock dislodging device was put into operation. Once in place, it was observed to vibrate the wire pieces within the entrainment radius of the slot-type exhaust. This exhaust had an average face velocity of 1300 fpm and was effective in capturing the non-adhered flock. Manual tamping became unnecessary.

The nuisance dust level was not measured. Dust levels were judged to be so low as to make an analysis of little value.

The flocking process itself posed little apparent potential for exposure to epoxy. Cleaning of the wire dipping mechanism was not observed but would presumably offer the potential for skin contact with epoxy. The worker and supervisor in the area both were observed to have blue flock adherant to their hands during the visit. Organic solvent was kept in the area for cleaning epoxy from machinery and skin.

VII. DISCUSSION AND CONCLUSIONS

No environmental dust sampling was performed because the exposure situation was eliminated once the exhausts and accessories were put in full working order.

The symptoms described by workers who work or have worked in the flocking area were consistent with nonspecific mucous membrane irritation. The medical histories did not suggest disease of the pharynx or respiratory tree. Workers stated that symptoms did not arise when scavenging equipment for excess flock prevented noticeable airborne flock and when a mask was worn while filling the flock reservoir.

The individuals interviewed were consistent in their assertions that the blue-dyed rayon flock caused more problems than did the white. Existing toxicology data do not refute the possible irritant affects of the blue dyes, and the binding of dyes to rayon would not prevent mucosal exposure to the dyes. However, one could hypothesize that both flock materials might cause similar nasal congestion and drainage as a simple dust phenomenon, but that

the blue coloration of nasal and throat secretions after exposure to blue-dyed flock caused increased concern amongst the workers. Cigarette smoking seemed not to be the sole cause of the symptoms but may have been an exacerbating factor.

Because proper work practices, proper mechanical maintainence, and minor modification of the flocking mechanism would prevent exposure to the flock, and because no serious medical problem was suggested by interview data, this inquiry has not generated an imperative need for further toxicological study of Direct Blue 80 or Direct Blue 106. However, it would seem that the dye manufacturer and the secondary handler who manufactures the flock should consider the obvious potential for pharyngeal and respiratory tree exposure to dyes that were not intended for internal use.

Quantities of epoxy used were small. Good work practices, including wearing of impervious gloves as needed, should readily minimize skin exposure to epoxy and to solvents used for cleaning.

VIII. RECOMMENDATIONS

1. All facets of the local exhaust ventilation for the primary flock exhaust and excess flock exhaust should always be in full working order. The primary flock exhaust intake should be modified according to Figure 1 to increase face velocity. Assuming a constant Q, this change would increase face velocity to 227 fpm, or 2.3 times the original value. The rough wood surfaces of the exhaust intake should be painted or replaced with smooth metal or plastic surfaces to prevent adherence and build-up of flock. The excess flock dislodger should be serviced on a preventive maintenance schedule. The machines should not be run if the dislodger is not fully functional.

2. A dust and particulate mask should be worn whenever the operator loads bulk flock into the hopper.

3. The work area should be vacuummed at the end of each shift to collect any fugitive flock. This will prevent it from being reentrained by air currents or by personnel moving through the area.

4. Impervious gloves should be available as needed to minimize skin exposure to epoxy and solvents during epoxy handling.

5. Good work practices in an area of a potential toxic exposure would preclude eating and smoking in the area.

IX. REFERENCES

1. Color Index & Society of Dyers and Colorists. Yorkshire, England (1971).

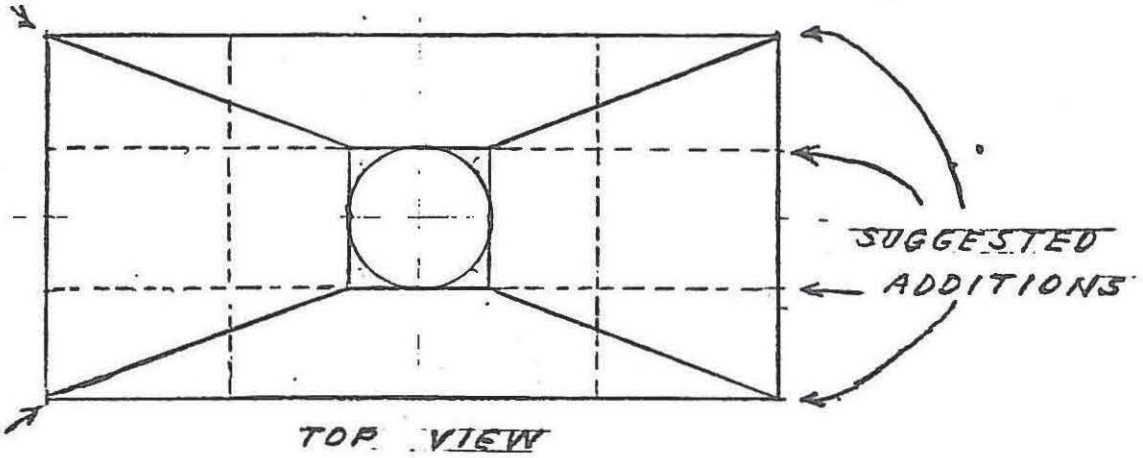
2. Threshold Limit Values for 1980. American Conference of Governmental Industrial Hygienists (1980).

3. Direct communication, Crompton and Knowles Corporation, Reading, Pennsylvania, 500 Pear Street, Box 341, Reading, Pennsylvania 19603.

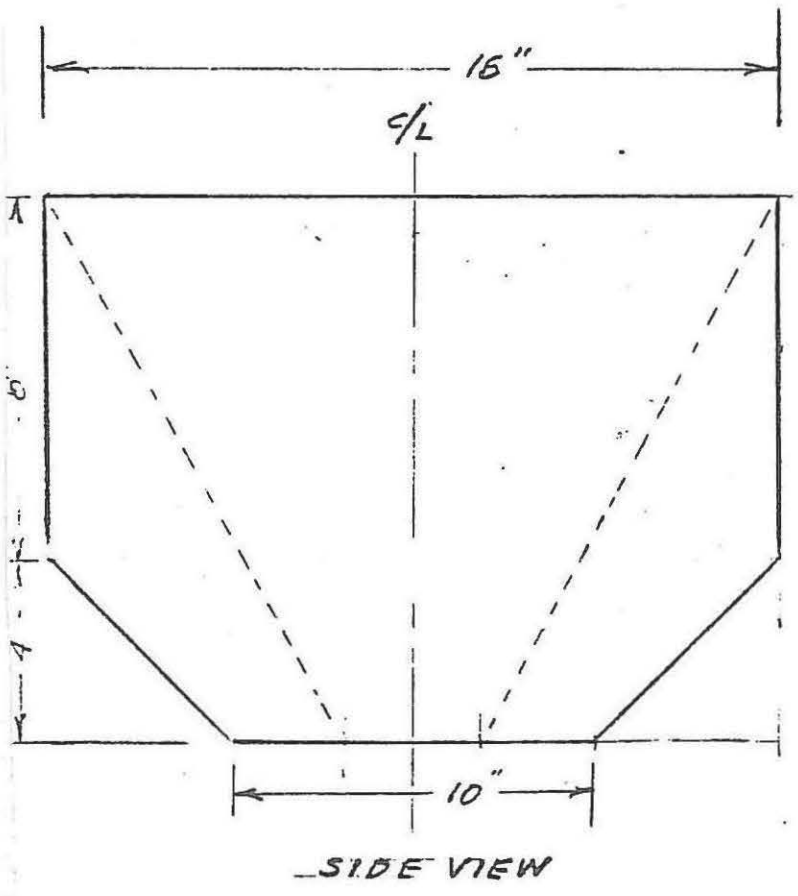
FLOCK EXHAUST INTAKE MODIFICATIONS

M & B METAL PRO. INC., LEEDS, ALA.

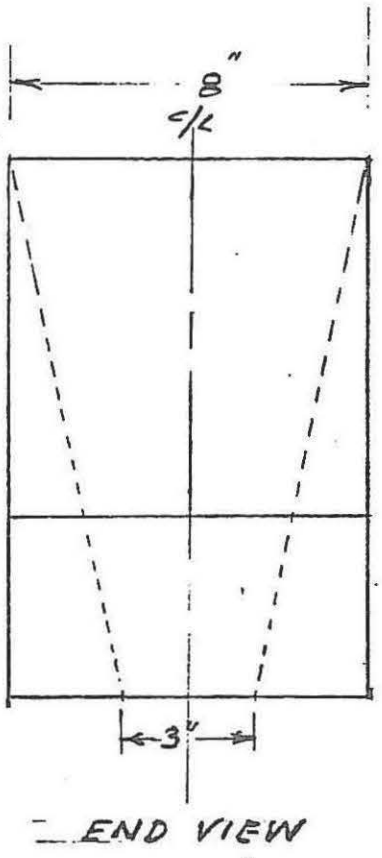
HE 80-214



TOP VIEW



SIDE VIEW



END VIEW

SCALE: 1" = 4"

FIGURE 1

VA

X. DISTRIBUTION AND AVAILABILITY OF REPORT

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Copies of this report have been sent to:

1. President, M&B Metal Products, Incorporated
2. Vice President, Local 543 UCLG
3. U.S. Dept of Labor, OSHA, Region IV
4. Regional Program Consultant, NIOSH, Region IV

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