

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

HEALTH HAZARD EVALUATION DETERMINATION  
REPORT NO. 77-9-391

CORRUGATED PAPER COMPANY  
WESTBORO, MASSACHUSETTS

MAY 1977

I. TOXICITY DETERMINATION

A Health Hazard Evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on November 16 through 18, 1976 at The Corrugated Paper Company, Westboro, Massachusetts. It has been determined on the basis of environmental sampling in the workplace and a review of the confidential health questionnaires that excessive exposures to paper and starch dust (nuisance dust) at the Baler and Mixing Tanks did exist within the working areas at the time of this survey.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

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

Copies of this report have been sent to:

- a) Corrugated Paper Corporation, Westboro, Massachusetts
- b) U.S. Department of Labor - Region I
- c) NIOSH - Region I

For the purpose of informing the approximately 40 "affected employees" the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) near where exposed employees work.

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 the employer regarding employee exposure to paper dust in the manufacture of shipping containers.

IV. HEALTH HAZARD EVALUATION

A. Description of Process-Conditions of Use

Corrugated Paper Corporation, Westboro, Massachusetts is a manufacturer of corrugated shipping containers of all types. At the corrugation machine heavy sheets of paper are combined to corrugated pieces of container material. These pieces are cut to size and hand stacked at the "cut off" end of the machine. Approximately six men handle this operation during a shift. Dust is generated at the "cut off" end where twin blades slice pieces of the material to size. Two flexible hoses are provided for local exhaust ventilation, but some dust is still generated.

The containers which are ready for final processing are sent to the printing machine where they are stamped for identification and trimmed. Generally, one person feeds the machine while three-four people stack and count the sheets of material as they roll off of the "die cutter". Dust is generated from the cutting operation as the pieces of material are sent through the printing machine. Local exhaust was provided for dust collection.

One scrapping operation was observed during the visit. The local exhaust ventilation systems are used to collect scrap pieces of material. The scrap pieces are pulled into a cyclone on the roof which contains a chute. The chute feeds a baling machine which compresses the scrap into bales. One worker is used to hand feed scrap into the baler.

The mixing of starch is an isolated operation which is performed by one operator, once a day for a period of two hours. The operator opens the 50 pound bags of starch by cutting the bag with a knife and dumping the contents into two large vats partially filled with water. During the dumping operation the employee is exposed to airborne particulate. The mixing operator was not (observed) wearing a respirator during the respective operation.

## B. Evaluation Design

An initial survey was conducted on November 16 through 18, 1976. This survey included obtaining background information, conducting a walk-through survey of the area, collecting the necessary environmental samples and interviewing 15 employees using a non-directed questionnaire to elicit symptoms experienced by workers on the days of the environmental sampling.

## C. Environmental Evaluation Methods

Personal respirable dust samples were collected in the worker's breathing zone on a tared VM-1 filter contained in a 2-piece cassette mounted in a 10 mm nylon cyclonic separator; air was pulled at a rate of 1.7 lpm.

Personal total dust and general area samples were collected on a tared VM-1 filter mounted in a 3-piece closed face cassette using a vacuum pump operating at a rate of 1.7 lpm.

Drager direct reading length of stain detector tubes were used to determine the presence and approximate concentration of carbon monoxide.

Sound pressure levels were measured using a General Radio (GR) model 1565B sound level meter.

## D. Evaluation Criteria

### 1. Physiological Effects

The following is a brief summary of the adverse effects which may result from excessive exposure to each of the substances of concern:

Nuisance Dust - Inhalation of excessive amounts cause no adverse effects in the lung. Elevated concentrations reduce visibility and may result in unpleasant deposits in the eyes and nose plus injury to the mucous membranes through mechanical action. The OSHA standard for an 8-hour time weighted average exposure to nuisance dusts is  $15 \text{ mg/M}^3$  while the current ACGIH threshold limit value is  $10 \text{ mg/M}^3$  for total particulate.

Carbon Monoxide - The signs and symptoms of acute carbon monoxide poisoning may include headache, nausea, vomiting, dizziness, drowsiness and collapse. Carbon monoxide exerts its harmful effect by reducing the oxygen-carrying capacity of the blood through the formation of carboxyhemoglobin. The intensity of the symptoms is related to the carboxyhemoglobin levels achieved. Deleterious effects to the heart may be initiated or enhanced in individuals with coronary heart disease who are exposed to carbon monoxide concentrations sufficient to produce a carboxyhemoglobin level greater than

5%. The role of cigarette smoking also must be considered since cigarette smoking causes increased exposure to carbon monoxide and there is an undeniable relationship between chronic cigarette smoking and increased risk of coronary heart disease. Important evidence also exists which indicates that subtle aberrations may occur in the central nervous system during exposure to low levels of carbon monoxide. Upon weighing all these factors, NIOSH in its 1972 criteria document recommended an 8-hour time weighted average exposure of 35ppm and a ceiling limit of 200 ppm.<sup>2</sup> The recommended time weighted average standard of 35 ppm is based on the concentration of carbon monoxide sufficient to produce a carboxyhemoglobin level not exceeding 5%. The ceiling concentration of 200 ppm represents an excursion above the 35 ppm level which is not expected to significantly alter the employees carboxy-hemoglobin level.

This recommended standard does not consider the smoking habits of workers since the levels of carboxyhemoglobin in chronic cigarette smokers has generally been found to be in the 4 to 5 percent range before exposure to carbon monoxide.

The current permissible OSHA limit for an 8-hour time weighted average exposure to carbon monoxide is 50 ppm. This value also is recommended by the ACGIH as its 1976 threshold limit value.

## 2. Environmental Evaluation Criteria

To assess the potential effects of air contaminants concentrations found in the place of employment, three primary sources of criteria were used (1) NIOSH criteria for recommended standards for occupational exposure to substance (criteria documents); (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) 1976; and (3) Occupational health standard as promulgated by the U.S. Department of Labor (29 CFR 1910.1000).

In the following tabulation of criteria, appropriate values are presented with reference:

<u>Substance</u>	<u>Permissible Exposures 8-hour Time Weighted Average</u>
<sup>1</sup> Nuisance Dust	10 mg/M <sup>3</sup> *
<sup>2</sup> Carbon Monoxide	35 ppm**

- \* mg/M<sup>3</sup> - milligrams of substance per cubic meter of air.  
\*\* ppm - parts of carbon monoxide per million parts of contaminated air by volume.

<sup>1</sup>Reference: 1976 ACGIH TLV for total nuisance dust is 10 mg/M<sup>3</sup>.  
The current OSHA standard is 15 mg/M<sup>3</sup>.

<sup>2</sup>Reference: The NIOSH 1972 criteria document, the 1976 ACGIH TLV  
and the current OSHA standard is 50 ppm.

TLV's or occupational health standards for substances are usually 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 a wide variation in individual susceptibility, some workers may experience ill effects at or below the designated levels. Thus an evaluation of the workplace cannot be based entirely upon comparisons made against such TLV's or standard, as various TLV's and standard do not represent absolute protection of all workers. Federal standards are the legal standards and enforcement is a responsibility of the U.S. Department of Labor, OSHA.

## E. Evaluation Results and Discussion

### 1. Environmental

It has been determined on the basis of environmental sampling in the work areas on November 17-18, 1976 that two of the 24 samples analyzed exceeded the "nuisance dust" criteria used in this evaluation. For a detailed description of all environmental samples, process operations and locations refer to Table I.

One personal breathing zone sample (for total dust) taken during the baling operation was 12.7 mg/M<sup>3</sup> which is in excess of the ACGIH TLV. This level can be attributed to the following: 1) lack of ventilation at the baler, 2) sloppy operation, 3) the use of an air hose to clean the baler area. The baler operator does not wear a respirator during the baling operation.

One personal breathing zone sample (for total dust) taken during the starch mixing operation was 15.1 mg/M<sup>3</sup> a level which is in excess of the ACGIH TLV and OSHA standard for an 8-hour time weighted average exposure. However, this sample was for a three hour period. The mixing operator was not (observed) wearing a respirator during the operation.

All other dust samples collected for respirable and total (nuisance) dust were at concentrations below the ACGIH TLV and the OSHA standard.

The carbon monoxide readings that were taken during the operations showed an average level of 5 ppm. This is below the existing standard of 50 ppm and the NIOSH recommended criteria of 35 ppm for an 8-hour time weighted average (TWA).

None of the noise measurements taken at the corrugator, printing, finishing, partition, die cutting, single face and waste bailing departments were above the existing OSHA health standard of 90 dBA for an 8-hour time weighted average (TWA).

## 2. Medical Results

Fifteen confidential employee medical interviews were conducted in an attempt to detect any adverse health effects attributed to the work environment. Three of the 15 employees had complaints. The responses indicated that the dust was acting as an irritant to the nasal passages and eyes and was not producing any symptoms of lower respiratory tract involvement. The predominant symptoms of exposure to the dust were sneezing, dry or plugged noses and headaches.

## 3. Conclusions

Based on the environmental sampling in the workplace, a review of the confidential health questionnaires and the current criteria outlined in Part D of this report, it was determined that the baler and mixer operators were exposed to excessive concentrations of nuisance dusts on the day of the survey (November 17, 1976). However, since some workers are, at times, subjected to dust levels which exceed the OSHA standard for nuisance dust, steps should be taken to keep workers exposed to as little dust as possible. Some general recommendations are listed below.

## V. RECOMMENDATIONS

1. Local exhaust ventilation should be designed for the baler and mixing tanks and installed as soon as possible to lower the dust levels in the area.
2. Until engineering controls are installed at the baler and mixing tanks a dust respirator should be worn. Respirators used should be those certified under the NIOSH Respirator Standard, 30 CFR, Part II.
3. The present procedure of using air hoses to clean the baling area should be discontinued and replaced with vacuum cleaning methods. Air hoses for cleaning should not be used in any areas.

## VI. REFERENCES

1. Documentation of Threshold Limit Values, American Conference of Governmental Industrial Hygienists, Committee of Threshold Limits, Cincinnati, Ohio.
2. Criteria for Recommended Standard for Occupational Exposure to Carbon Monoxide.

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TABLE I

Corrugated Paper Company  
Westboro, Massachusetts

Job And/Or Location	Date	Sampling Period	Sample Volume (Liters)	Type	Paper Dust $\text{mg}/\text{M}^3$ * (Nuisance Dust) Total Dust	Paper Dust $\text{mg}/\text{M}^3$ (Nuisance Dust) Respirable	Starch Dust $\text{mg}/\text{M}^3$ (Nuisance Dust) Total	Starch $\text{mg}/\text{M}^3$ (Nuisance Dust) Respirable
Corruqator	11-17-76	0804-1503	650	PBZ**	0.4	-	-	-
Corruqator	11-17-76	0804-1503	650	PBZ	-	0.1	-	-
Shafter	11-17-76	0802-1500	710	PBZ	1.0	-	-	-
Shafter	11-17-76	0802-1500	710	PBZ	-	0.3	-	-
Off Bearer	11-17-76	0803-1502	710	PBZ	2.1	-	-	-
Off Bearer	11-17-76	0803-1502	710	PBZ	-	0.2	-	-
Slotter	11-17-76	0815-1528	680	PBZ	2.7	-	-	-
Slotter	11-17-76	0815-1528	680	PBZ	-	0.2	-	-
Stacker	11-17-76	0819-1526	670	PBZ	0.7	-	-	-
Baler	11-17-76	0825-1511	620	PBZ	12.7	-	-	-
Baler	11-17-76	0825-1511	620	PBZ	-	0.3	-	-
Bundler	11-17-76	0830-1516	620	PBZ	1.1	-	-	-
Saw Area	11-17-76	0834-1514	680	GA***	0.4	-	-	-
Slitter	11-17-76	0840-1515	610	PBZ	0.5	-	-	-
Slitter	11-17-76	0840-1515	610	PBZ	-	0.3	-	-
Utility	11-17-76	1015-1533	540	PBZ	0.8	-	-	-
Utility	11-17-76	1015-1533	540	PBZ	-	0.2	-	-
Chopper	11-18-76	0745-1116	360	PBZ	0.5	-	-	-
Baler	11-18-76	0750-1113	350	PBZ	5.1	-	-	-
Baler	11-18-76	0750-1113	350	PBZ	-	0.5	-	-
Stacker	11-18-76	0758-1120	340	PBZ	3.4	-	-	-
Stacker	11-18-76	0758-1120	340	PBZ	-	0.9	-	-
Mixer	11-17-76	0751-1108	330	PBZ	-	-	15.1	-
Mixer	11-17-76	0751-1108	330	PBZ	-	-	-	0.5

The 1976 ACGIH TLV for total nuisance dust is  $10 \text{ mg}/\text{M}^3$

The current OSHA standard for total nuisance dust is  $15 \text{ mg}/\text{M}^3$

The 1976 ACGIH TLV and the current OSHA standard for respirable fraction is  $5 \text{ mg}/\text{M}^3$

\* $\text{mg}/\text{M}^3$  - Milligrams of substance per cubic meter of air.

\*\*Personal Breathing Zone

\*\*\*General Area

Samples were weighed on a Perkin-Elmer Autobalance AD-2 to .01 grams.