

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

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-85-185

M. H. Gall Company
Lancaster, Pennsylvania

April 1975

I TOXICITY DETERMINATION

It has been determined that a potential health hazard exists in the lamination press area from vinyl chloride gas at the concentrations measured during the normal operation. This determination is based upon environmental measurements obtained on August 14, and October 22, 1974, observations of work practices and a review of past medical reports.

NIOSH recommends that the employer reduce air concentrations of vinyl chloride to levels not detectable as determined by the recommended analytical method. Any employee who is exposed to measurable concentrations of vinyl chloride shall wear personal respiratory protective equipment approved by NIOSH for such use.

II DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation determination are available upon request from the Hazard Evaluation Service Branch, NIOSH, U. S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202.

- a) M. H. Gall Company
- b) U. S. Dept. of Labor - Region III
- c) NIOSH - Region III

For the purpose of informing approximately 5 employees, this report shall be posted in a prominent place readily accessible to workers for a period of at least 30 days.

III INTRODUCTION

Section 20(a) (6) of the Occupational Safety and Health Act of 1970, 29 U. S. Code 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.

INTRODUCTION

The National Institute for Occupational Safety and Health re-received such a request from the M. H. Gall Company to evaluate the potential hazards associated with the alleged exposure to vinyl chloride at a lamination operation.

IV HEALTH HAZARD EVALUATION

This Company performs lamination of printed material on a jobbing basis and production varies on a seasonal basis. The only laminate used is a polyvinyl chloride (PVC) based product. Both PVC and printed material are received from outside sources in a ready to use form. Sheets of PVC are placed on either side of printed material which is then placed between two sheets of a cellulose blotter, to complete a layer. Each layer is separated by a chrome press plate to add support. This sequence is then repeated until a five layer "sandwich" is completed. The sandwich is then placed in the heating stage of the press for curing. Upon completion of the heating (curing) cycle the press is opened and the sandwich is lowered to the cooling stage of the press. At the point when the press was opened visible emissions were noted. Upon completion of the cooling cycle, the laminated material is removed from the sandwich, trimmed, and packaged for shipment.

All operations at the time of the surveys were conducted in the basement of a house owned by the company president. Consideration is being given to relocating operations to a permanent structure away from the house.

B. Evaluation Design

An initial survey of M. H. Gall Company was completed by Wesley E. Straub, NIOSH, Region III, Industrial Hygienist on August 14, 1974. A follow-up environmental survey was conducted by Mr. Straub on October 22, 1974.

C. Evaluation Methods

Employee exposures to vinyl chloride were evaluated during the initial visit using personal air sampling equipment. Air samples were collected utilizing activated charcoal tubes and analyzed for vinyl chloride by gas chromatography.¹ The limit of sensitivity for the chromatographic technique used on this study is 0.2 parts per million parts of air (ppm) for vinyl chloride.

Evaluation Methods

During the environmental survey, air samples were again collected on activated charcoal tubes. One half of the tubes were analyzed by gas chromatography for vinyl chloride while the remaining samples were analyzed on a semi qualitative and quantitative basis. Samples were also taken at this time using Drager direct reading tubes for benzene and hydrogen chloride. The limit of sensitivity for the benzene and hydrogen chloride detector tubes used is approximately 15 ppm and 1.0 respectively.

Stationary air samples were collected during both surveys in an attempt to compare point of generation concentration versus concentrations encountered by the operator.

D. Evaluation Criteria

Vinyl chloride, is now suspected as being an ethiological agent in the development of a form of liver cancer (angiosarcoma). Based on theoretical considerations, as stated in NIOSH's Recommended Standard for Occupational Exposure to Vinyl Chloride, "there is probably no threshold for carcinogenesis although it is possible that with very low concentrations, the latency period might be extended beyond the life expectancy. In view of these considerations and NIOSH's inability to describe a safe exposure level as required in section 20(a) (3) of the Occupational Safety and Health Act, the concept of a threshold limit for vinyl chloride gas in the atmosphere was rejected." The occupational health standards pertaining to this evaluation based on the most recent and relevant information are as follows:

Recommended Threshold Limit Values

<u>Substance</u>	<u>TWA</u> (a) <u>ppm</u>	<u>STEL</u> (b) <u>ppm</u>
Vinyl chloride	Not Applicable (c)	(c)
Benzene	10	25 (d)
Hydrogen chloride	-	5

- a. TWA - Time Weighted Average for an 8-hour day exposure.
- b. STEL - Short Time Exposure Limit - for up to 10 minutes or instantaneously.
- c. Criteria for a Recommended Standard - Occupational Exposure to Benzene - NIOSH, 1974.
- d. Documentation of the Threshold Limit Values for Substances in Workroom Air. 3rd edition, ACGIH, 1971.

V

RESULTS AND DISCUSSION

Samples collected during the initial visit indicated the presence of vinyl chloride (see Table 1). The highest concentration reported (0.46 ppm) was obtained during stationary sampling at the lamination press. The breathing zone concentration as expected show a lower value due to relative distance from the lamination press and movement of worker away from areas of higher concentration.

Qualitative and quantitative analysis run on one half of the samples collected during the October environmental survey indicated no detectable organic vapors or gases present after correction for high background counts. The remaining samples were analyzed for vinyl chloride and no detectable levels were found. Direct readings obtained for benzene and hydrogen chloride resulted in no detectable levels for either contaminant. Lower vinyl chloride levels noted during the second visit appeared to be the result of increased use and effectiveness of a wall fan located near the laminations press.

These results indicate that vinyl chloride levels in the lamination press area are extremely low, but can be detected and will vary depending on the operational conditions present. It is therefore concluded that a potential health hazard exists and the following recommendations are made:

- 1) Any employee who is exposed to measurable concentrations of vinyl chloride shall wear appropriate personal respiratory protective equipment approved by NIOSH for such use.
- 2) Reduce air concentrations of vinyl chloride to levels not detectable, at all times by the recommended analytical method.¹ This may be accomplished by providing mechanical exhaust ventilation to control emissions from the press at the point of generation. The lamination press should also be isolated to prevent possible contamination of adjacent areas. Isolation of the press could be achieved by utilizing a modification of the enclosure shown in Attachment A. This diagrams a

laboratory hood and is reprinted from the American Conference of Governmental Industrial Hygienists' book on industrial ventilation entitled a Manual of Recommended Practices.²

VI REFERENCES

1. NIOSH Manual of Analytical Methods P&CAM #178, HEW Publication No. (NIOSH) 75-121.
2. Industrial Ventilation, A Manual of Recommended Practices, American Conference of Governmental Industrial Hygienists, Tenth Edition, Lansing, Michigan 48902.

AUTHORSHIP AND ACKNOWLEDGMENT

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TABLE I

AIR CONCENTRATION
M. H. Gall Company
Lancaster, Penna.

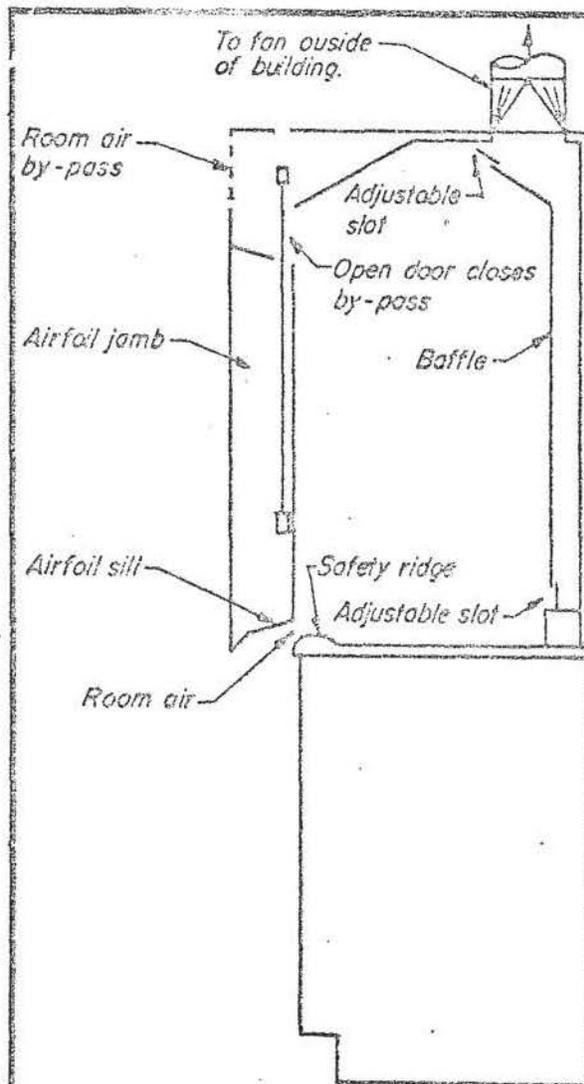
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Location	Operation	Time Sample (hours)	Vinyl Chloride ⁽¹⁾ (ppm) (3)	Remarks	Collection Date	Exposure time	
Basement work area	Tending lamination pres	1.5	N.D. (3)	Operator's exposure	8/19/74	Maximum of 6 hours per day	
		1.5	N.D.				
		1.75	N.D.				
		1.75	.39				
		1.25	.26				
		1.25	.26				
			.25	N.D.	Operator's exposure	11/22/74	Maximum of 6 hours per day
			.25	N.D.			
			.25	N.D.			
			.25	N.D.			
		.25	.46	General air alongside lamination press	8/19/74		
		.25	N.D.				
		.50	.22				

1) Threshold Limit Value base on a Time Weighted Average for an 8-hour day - limit of detection or approximately 0.2 ppm

2) ppm - parts of vapor or gas per million parts of air

3) N.D. - denotes none detected

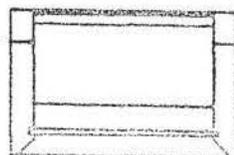


$Q = 100-150 \text{ cfm/sq ft of door area}$

Duct velocity = 1000-4000 fpm to suit conditions

Entry loss = 0.25 duct VP

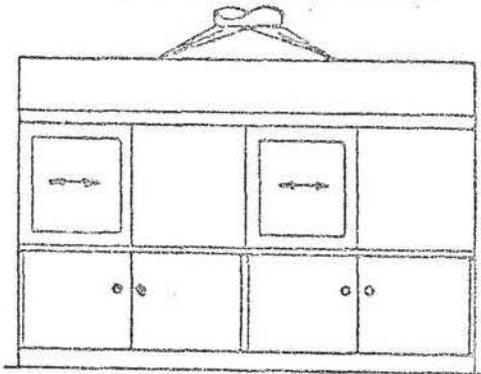
Refer to VS-204



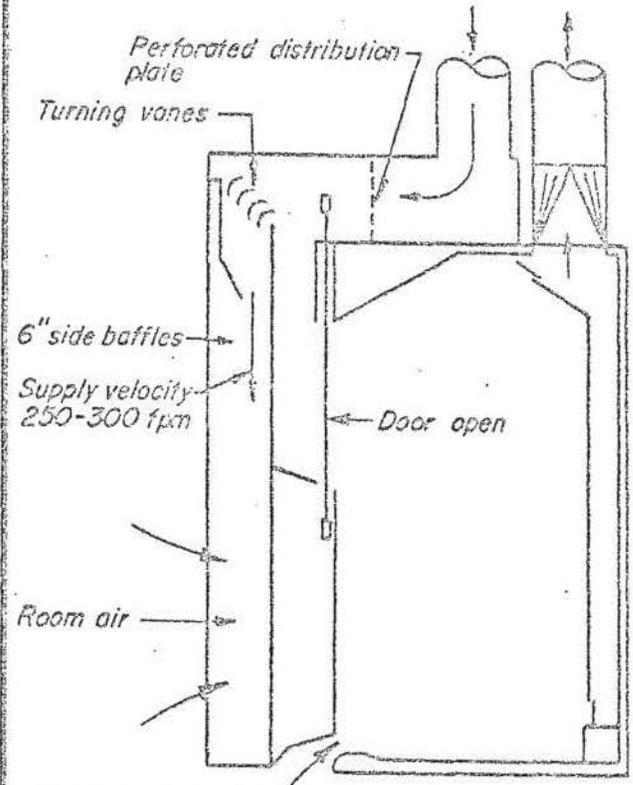
Plan view of hood with airfoil jambs and sill.

METHODS OF CONSERVING CONDITIONED AIR

1. Use glove box. See VS-202
2. Use sliding sash on large hoods.



3. Supply outside air up to 50% of exhaust volume through opening outside hood face. Temper during winter months.



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DATE

1-68

VS-203

- A. Exhaust volume
- | | |
|--|---|
| 1. 100 cfm/sq ft of door area | Nuisance, corrosive materials.
Moderate toxicity materials.
Tracer quantities of radioisotopes. |
| 2. 150 cfm/sq ft of door area | High toxicity materials (TLV \leq 5ppm;
0.2 mg/m ³). |
| 3. Glove Box (Dry Box) preferred
(Use bench hood with caution
and only under ideal conditions) | Low MPC radioactive materials
Very high toxicity materials.
(Pathogenic microorganisms) |
- B. Provide uniform exhaust air distribution in hood. Adjustable baffles and slots are acceptable, but subject to tampering.
- C. Locate hood away from heavy traffic aisles, doorways and supply grilles.
- D. Use corrosion resisting materials suitable for expected use.
- E. Locate exhaust fans outside of buildings.
- F. Avoid sharp corners at jambs and sill. Flanges and rounded hood inlets are desirable.
- G. Provide filters for radioactive materials in greater than 'exempt' quantities.
- H. By-pass opening in hood is desirable to avoid excessive indraft under partially-closed sash and to simplify laboratory air flow balance.
- I. Installation and maintenance.
Adjust air flow for $\pm 20\%$ variation in face velocity. Use suitable velocity measuring instrument. (See Section 9)
Inspect hood periodically; monthly for new or critical installations.
Quarterly or semi-annually for others.
- J. Provide tempered make-up air to laboratory. Make-up air volume to be selected for slight indraft of air from corridor or adjacent rooms.
- K. In order to reduce exhaust volumes, local exhaust hoods should be considered instead of laboratory bench hoods for fixed set-ups.

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VS-204