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. 77-76-438

STANLEY STRUCTURES
DENVER, COLORADO

OCTOBER 1977

## I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on July 29, 1977, at Stanley Structures (pattern and carpenter shop), Denver, Colorado. At the time of this evaluation, breathing zone air samples were taken for styrene, acetone, methyl ethyl ketone (MEK), and isopropanol. Trace quantities of styrene and acetone were found. However, MEK and isopropanol were below laboratory detection limits. Confidential employee interview forms were completed on all workers in this area. Based on these interviews and the environmental samples, it is evident that a health hazard did not exist at the time of this evaluation. A fire hazard existed throughout the area where the hazard evaluation was conducted.

## II. DISTRIBUTION AND AVAILABILITY

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) Stanley Structures
(b) U.S. Department of Labor - Region VIII
(c) NIOSH - Region VIII

For the purpose of informing the five affected employees, copies of the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

## 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 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.

NIOSH received such a request from plant management at Stanley Structures, Denver, Colorado, to evaluate potential hazards associated with exposures to styrene, acetone, MEK, and isopropanol during the manufacture of wood molds and patterns.

## IV. HEALTH HAZARD EVALUATION

### A. Process Evaluated

Stanley Structures, Denver, Colorado, is a large pre-stressed concrete company. The area evaluated in this survey was a small carpenter shop that made wood molds and patterns that are used throughout the plant. Glues and filler compounds are used along with wood to make molds and patterns. These compounds contain styrene, acetone, MEK, and isopropanol. The plant safety engineer was concerned that there might be an exposure, since the odor of these compounds was evident throughout the carpenter shop.

### B. Evaluation Design and Methods

Breathing zone air samples to determine the concentrations of styrene, acetone, MEK, and isopropanol were taken on all workers in the carpenter shop using organic vapor charcoal tubes and low volume pumps operated at approximately 50 cubic centimeters per minute. All environmental samples were analyzed by gas chromatography according to NIOSH method P&CAM #127 using a Tracor 222 gas chromatograph with a flame ionization detector. All workers were interviewed.

### C. Criteria for Assessing Workroom Concentrations of Air Contaminants

The three sources of criteria used to assess workroom concentrations of air contaminants were: (1) recommended threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH)(1976); (2) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910), January 1976; and (3) NIOSH criteria for recommended standard for isopropanol, March 1976.

| | Permissible Exposures 8-Hour Time-Weighted Exposure Basis ($mg/M^3$) | | |
|---|---|---|---|
| Substances | TLV | OSHA Standard | NIOSH Criteria For Recommended Standard |
| Styrene | 420 | 420 | --- |
| Acetone | 2400 | 2400 | --- |
| Methyl Ethyl Ketone | 590 | 590 | --- |
| Isopropanol | 980 | 980 | 980 |

$mg/M^3$ = approximate milligrams of substance per cubic meter of air

Occupational health standards are established at levels designed to protect individuals occupationally exposed to individual toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

D. Toxicology

1. Styrene

Prolonged exposures to styrene above 420 $mg/M^3$ may result in functional disorders, an increase in deep reflexes, irritation of the upper respiratory tract, leucopenia, and lymphocytosis. Exposures to styrene in concentrations less than 50 $mg/M^3$ cause isolated cases of liver malfunction.[1]

2. Acetone

Acetone is one of the least hazardous of the volatile solvents. Eye, nose, and throat irritation occur only after very high exposures such as in tanks and closed compartments. Narcotic (anesthetic) effects with headache, drowsiness, and incoordination should not occur under usual conditions.

Acetone is not known to produce chronic or accumulative systemic effects. Repeated and prolonged skin contact with the liquid can cause dryness and mild irritation of the skin.[2]

The 2400 $mg/M^3$ threshold limit is well below a concentration capable of producing narcotic symptoms or mucous membrane irritation. It is practically devoid of inhalation hazard.[3]

3. Methyl Ethyl Ketone (MEK)

MEK is a widely used industrial solvent. Prolonged exposures above the TLV of 590 $mg/M^3$ may cause mucous membrane irritation, nausea, vomiting, dermatitis, headache, and paresthesias. Workers strongly object to its odor. However, there have been very few reports of serious ill effects.

4. Isopropanol

Overexposures to isopropanol are rare. Isopropanol acts as a local irritant and in high concentrations as a narcotic. It can cause corneal burns and often eye damage. It is not considered an important industrial toxic hazard. It should be noted that in the production of isopropanol, hazardous compounds are used.

E. Environmental and Medical Results and Discussion

Results of environmental sampling showed that workers were not overexposed to styrene, acetone, MEK, and isopropanol. There were only five workers in this shop. All workers were monitored, and results may be reviewed in Table I. The workers used these solvents very infrequently, and usually the entire time of use is limited to 1-1/2 to 2 hours. Therefore, the total time the solvents were used was monitored during this survey.

Ventilation measurements were made in the area where the solvents were used. Two large exhaust fans were located at the top and bottom of a wall. These fans exhausted approximately 1,000 linear feet per minute to the outside. This is more than adequate to eliminate toxic vapors from the work area. A minimum of 400 linear feet per minute would be required for adequate ventilation. All five workers were interviewed. None of them had complaints.

There were numerous safety hazards located throughout this area. Explosion-proof lights were not installed in areas where these solvents were used. Fire protection such as a sprinkler system or adequate fire extinguishers was not available.

Conclusions

Results of environmental data and confidential employee interviews illustrate that a health hazard did not exist at the time of this evaluation.

## V. RECOMMENDATIONS

1. Adequate fire prevention devices should be installed.

2. If respirators are to be provided, a respirator program must be initiated, following all the rules and regulations of the OSHA standard (Subpart I, 1910.134).

## VI. REFERENCES

1. International Labour Office, Geneva. Occupational Health and Safety, Volume II, McGraw-Hill Book Company, p 1363, 1972.

2. Acetone, Chemical Safety Data Sheet SD-87, August 1962.

3. Acetone, Hygienic Guide Series, American Industrial Hygiene Association, January 1964.

## VII. AUTHORSHIP

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TABLE I

ATMOSPHERIC CONCENTRATIONS OF STYRENE, ACETONE, METHYL ETHYL KETONE, AND ISOPROPANOL

STANLEY STRUCTURES
DENVER, COLORADO

July 29, 1977

| Sample Number | Location | Classification | Time of Sample | Styrene | Acetone | Methyl Ethyl Ketone | Iso-propanol | Type of Sample |
|---|---|---|---|---|---|---|---|---|
| | | | | ($mg/M^3$) | | | | |
| 1 | Carpenter Shop | Carpenter | 8:45 - 10:00 A.M. | 41 | 8 | * | * | BZ |
| 2 | Carpenter Shop | Carpenter | 8:40 - 10:05 A.M. | * | * | * | * | BZ |
| 4 | Carpenter Shop | Carpenter | 8:40 - 10:10 A.M. | 24 | * | * | * | BZ |
| 5 | Carpenter Shop | Carpenter | 8:40 - 9:30 A.M. | 160 | 9 | * | * | BZ |
| 6 | Carpenter Shop | Carpenter | 8:45 - 9:45 A.M. | * | * | * | * | BZ |
| | | | EVALUATION CRITERIA | 420 | 2400 | 590 | 980 | |
| | | | NIOSH LIMIT OF DETECTION | .04 | .02 | .03 | .04 | |

$mg/M^3$ = approximate milligrams of substance per cubic meter of air

BZ = breathing zone

* = below detection limits