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Abstract (Limit: 200 words)

Environmental air samples were analyzed for asbestos (1332214) at Saint Elizabeths Hospital (SIC-8063) in Washington, D.C. on February 16 and 17, 1977. An evaluation request came from an authorized representative of the hospital on behalf of an unspecified number of construction workers under contract at St. Elizabeths Hospital as well as the general hospital staff. Asbestos concentrations with fibers greater than 5 microns in length ranged from 0.11 to 3.02 fibers per cubic meter (f/cc), compared with the NIOSH recommended 8 hour time weighted average standard of 0.1f/cc greater than 5.0 microns in length. The author concludes that the construction workers and certain hospital employees are exposed to excessive concentrations of asbestos containing dusts during construction. He recommends use of Local exhaust ventilation at the construction site, use of hazard warning signs, limited access to the construction site, use of full face respirators, and personal and housekeeping hygienic measures.

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HAZARD EVALUATION & TECHNICAL ASSISTANCE BRANCH  
REPORT NO. TA 77-20

ST. ELIZABETH'S HOSPITAL  
WASHINGTON, D.C.  
JULY, 1977

Study Requested by: Arthur N. Cammarano  
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Region III

Survey Dates: February 16, 17, 1977

I. SUMMARY

It has been determined that employees of Arlanda Construction Company working under contract at St. Elizabeth's Hospital and potentially the general hospital staff are being exposed to excessive concentrations of asbestos-containing dust during fire door lock installation.

This determination is based on the analysis of air samples, observations, of work practices, and a review of recent pertinent information.

II. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a request for technical assistance from an authorized representative of St. Elizabeth's Hospital regarding a contractor's exposure to asbestos while installing fire doors. This technical assistance was conducted under the authority and regulations established by NIOSH in 42 CFR Part 85a, Occupational Safety and Health Investigations of places of Employment.

Copies of this Technical Assistance Report are available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination, 4676 Columbia Parkway, Cincinnati, OH 45226. Copies have been sent to:

- a) St. Elizabeth's Hospital
- b) Arlanda Construction Company
- c) U.S. Department of Labor - Region III
- d) NIOSH - Region III

III. EVALUATION

A. Process of Description

St. Elizabeth's Hospital is a 2,700 patient mental hospital with associated facilities covering roughly 300 acres. As part of a general upgrading to comply with life safety codes, a process of replacing interior doors has been initiated. At present, Weldwood® Fire Doors are being installed which have an asbestos-containing core. Due to the age of many of the buildings and variations in door sizes, doors are being hung in place prior to installing locks, thus allowing proper alignment with keyways. Operations performed may include routing, drilling and hand chiseling to prepare the door for lock installation.

## B. Evaluation Design and Method

An environmental survey was conducted at the St. Elizabeth's Hospital on February 16 and 17, 1977. Samples were collected to give both personal exposures and general air levels in the work area.

Air samples were collected on 0.8 micron pore size mixed cellulose ester filters using MSA Monitaire Personal Samplers or Millipore vacuum-pressure pumps operating at 1.7 and 9.0 liters per minute respectively. Samples were subsequently evaluated microscopically using a phase contrast microscope technique.<sup>(1)</sup>

## C. Evaluation Criteria

The primary source of environmental criteria considered in this report is the NIOSH Re-examination and Update of Information on the Health Effects of Occupational Exposure to Asbestos (December, 1976). NIOSH recommends that occupational exposure to all types of asbestos be controlled so that no worker will be exposed to airborne concentrations of asbestos in excess of 0.1 fibers over 5 microns in length per cubic centimeter on an eight-hour time-weighted-average (TWA) basis. In addition, no worker will be exposed to peak concentrations in excess of 0.5 fibers per cubic centimeter of air based on a fifteen minute sampling period.

Previously, in a criteria document transmitted to the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, on January 21, 1972, NIOSH recommended that occupational exposure to asbestos be limited to 2.0 fibers over 5  $\mu$ m in length per cubic centimeter of air, determined as a time-weighted average exposure for an 8-hour workday, and to a peak concentration of 10 fibers over 5  $\mu$ m in length per cubic centimeter determined by a minimum sampling time of 15 minutes (presently, the OSHA standard as of 7/1/76 and covered in 29 CFR 1910.1001). That recommended standard was designed primarily to prevent asbestosis. Recognizing that there was then insufficient information to establish a standard to prevent such other asbestos-related diseases as pulmonary, pleural, and peritoneal neoplasms, NIOSH had included in its calculations a safety factor intended to guard against neoplasms more adequately than unmodified environmental limits based solely on prevention of asbestosis.

Currently it is not possible to establish a safe exposure level for the carcinogenic activity of asbestos. Therefore, the exposure values now recommended by NIOSH are based on what NIOSH considers to be the lowest concentration at which asbestos fibers can be monitored reliably using phase-contrast fiber counting procedures.

#### D. Results and Discussion

Upon arriving at the work site it was noted that no mechanical exhaust ventilation was being used when performing lock installation and that clean up was by dry sweeping. In view of the hazards associated with asbestos, it was requested that an industrial type vacuum cleaner, which was available, be used to control dust emissions. This modification in procedure was initiated during the evaluation, therefore, the data presented in Table I represents conditions that were probably somewhat improved over normal conditions.

Air sampling was conducted to show peak and background concentrations in addition to worker exposures. As indicated by the data any worker spending his normal work time in the area where door locks are being installed would have an excessive exposure. The carpenter actually installing locks, even with exhaust ventilation being used, was exposed to concentrations exceeding the ceiling value of 0.5 fibers per cubic centimeter of air.

Background concentrations although in excess of 0.1 fibers per cubic centimeter of air should not represent a health hazard to the general staff who would be passing by the work area. However, workers who would spend from 6 to 8 hours in the general area of the work would be at risk of being excessively exposed. When the general staff is exposed, the time generally is short (two or three days) which also aids to reduce overall risk.

Although the use of an industrial vacuum cleaner will have helped reduce concentrations in the area of the carpenter installing locks, it may have added to the general background concentrations as indicated by sample AA-14. The method of sampling used in evaluating the vacuum cleaner, while very crude, did provide some general information indicating the unit could be presenting a problem. Solutions to this aspect of the problem would include: (1) purchase of a more efficient unit which is commercially available, and (2) positioning the collector outside, while running the hose inside to the work area, preventing recirculation of air.

#### IV. CONCLUSIONS

In conclusion, workers of Arlanda Construction Company were exposed to air concentrations in excess of more restrictive NIOSH recommended asbestos levels both on a time weighted and short-term or ceiling value basis even when local exhaust ventilation was being used. If local exhaust ventilation were not being used, it is anticipated that the levels encountered would have represented a serious health hazard.

Although the carpenter installing locks was wearing a respirator during the worst aspects of the lock insertion, the levels encountered

and those that might be expected without ventilation are such that the effectiveness of the personal respirator equipment used becomes questionable.

A recent NIOSH review of asbestos-related literature reported one paper<sup>(2)</sup> that indicated an excess mortality from lung cancer was found in 65 men who had been exposed to an unmeasured concentration of amosite asbestos for less than one month thirty years previously. The mortality rate was determined on an age-specific basis.

This paper is mentioned to point out two items: (1) that the latency period for asbestos may well extend between 20 and 40 years. This means that the disease may undergo a long development before a tumor is actually detected. At such a point a tumor will have reached a stage where removal of the worker from the work place may be of no avail and where treatment may be extremely difficult, and with limited success; and (2) that short construction jobs may present a very real hazard.

Prudent policy would therefore dictate that every reasonable measure should be taken to limit exposures and provide early detection of developing medical problems.

Because it is not possible to specify a safe exposure level for a carcinogen, only a ban on the use of asbestos can ensure complete protection against this mineral's carcinogenic effect. Therefore, emphasis should be placed on prohibiting the occupational use of asbestos in other than completely closed operations and on substituting other products whenever possible. Asbestos should be replaced, where technically feasible, by substitutes with the lower possible chronic toxicities.

## V. RECOMMENDATIONS

1) An area should be designated for working on lock installation until such a time that non-asbestos core doors can be purchased.

2) Asbestos containing dust should be collected at the point of generation using local exhaust ventilation. An industrial type vacuum cleaner equipped with high efficiency filter system (>99% efficiency for 0.3 um diameter aerosols) may provide effective control when work is necessary in wards and air cannot be exhausted to the outside. Additional information can be obtained from the Asbestos Information Association, 1835 K Street, N.W., Washington, D.C. 20006 regarding manufacturers of equipment that meet these standards.

3) Entrances into work areas where lock insertion is being done should be posted with an asbestos exposure warning sign as follows:

Asbestos  
Dust Hazard  
Avoid Breathing Dust  
Do Not Remain in Area Unless Your Work Requires It  
Breathing Asbestos Dust May Cause Asbestosis and Cancer

4) Access into work area where asbestos dust is being released should be limited to those workers who must enter the area.

5) During lock installation, a high efficiency particulate filter respirator with a full face piece; or any supplied air respirator with a full face piece; or any self-contained breathing apparatus with a full face piece should be used when exposures are between 10 and 50 times the applicable exposure limit. When exposures are between 10 times the applicable limit and the limit any air purifying respirator with replaceable particulate filter or any supplied air respirator or any self-contained breathing apparatus may be used.

6) Industrial vacuum cleaner bags containing asbestos dust should be sealed in plastic bags and labeled with the following warning label printed in letters of sufficient size and contrast to be readily visible and legible:

Caution  
Contains Asbestos Fibers  
Avoid Breathing Dust  
Breathing Asbestos Dust May Cause Asbestosis and Cancer

All asbestos waste shall be disposed of in accordance with the OSHA Asbestos regulations 29 CFR 1910.1001 (h). An approved respirator as previously described shall be worn during the removal of vacuum bags.

7) All floor cleaning in areas where locks are being installed on fire doors should be done with the high efficiency industrial vacuum cleaner. Dry sweeping of floors should be prohibited.

8) The appropriate portions of the OSHA regulations on asbestos (29 CFR 1910.1001 (d) (3) and (4) concerning special clothing change rooms, etc, should be followed.

9) On January 19, 1977, in the letter to Bell Laboratories, former Labor Assistant Secretary Corn established an unofficial "Action level" of 0.1 fibers greater than 5 microns in length per cubic centimeter of air and an 8-hour time weighted average basis for requiring medical and environmental monitoring. Therefore, the appropriate portions of the OSHA regulations 29 CFR 1910.1001 (f) and (j) regarding environmental and medical monitoring should be followed by the contractor.

VI. REFERENCES

1) NIOSH Manual of Analytical Methods, HEW Publication No. 75-121, P & CAM. 239

2) Seidman, H., Lillis, R., Selikoff, I., "Short Term Asbestos Exposures and Delayed Cancer Risk", 3rd International Symposium on Detection and Prevention of Cancer, New York, NY, May 1, 1976.

VII. AUTHORSHIPS AND ACKNOWLEDGMENT

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Fiber Concentrations  
St. Elizabeth's Hospital  
Washington, D.C., S.E.  
Report TA 77-20  
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Location	Sample	Asbestos Fibers/cc*	Time	Comments
Richardson #1	AA-5	3.02	14:10-15:00	Operator's exposure, installing one lock, low volume
	AA-6	1.19	14:10-14:50	Operator's exposure, installing one lock, high volume
	AA-11	0.86	11:15-11:40	
	AA-13	0.49	13:20-13:55	
	AA-2	0.42	10:12-11:50	Operator's exposure, installing locks, AM only
	AA-7	0.40	10:12-11:55	
	AA-12	0.43	12:55-14:52	Operator's exposure, installing locks, PM only
	AA-8	0.13	10:12-14:52	Operator's exposure, installing locks, AM and PM
	AA-1	0.24	10:12-15:00	
	AA-3	0.27	10:20-14:55	General Air, tool Dolly for door installation equipment
	AA-9	0.17	10:20-14:50	
	AA-4	0.31	10:25-14:58	General Air, fire hose cabinet door end of main hall
	AA-10	0.11	10:22-14:47	General Air, work table middle of hall
	AA-14	1.36	14:40-14:55	General Air, air discharge from "dust collector" vacuum cleaner

\*) denotes asbestos fibers greater than 5 microns in length per cubic centimeter of air. NIOSH revised Recommended Standard 0.1 fibers per cubic centimeter greater than 5.0 microns in length on an 8-hour time weighted basis and 0.5 ceiling limit based on a 15 minute sampling period.

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