50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. Recipient's Accession No. PB85 103828

4. Title and Subtitle
Hazard Evaluation and Technical Asistance Report No. TA-76-063, Smithsonian Institution, Washington, D.C.

5. Report Date
76/11/00

6.

7. Author(s)
Price, J.H.

8. Performing Organization Rept. No.
TA-76-063

9. Performing Organization Name and Address
Division of Surveillance, Hazard Evaluation and Field Studies, NIOSH, U.S. Department of Health, Education, and Welfare, Cincinnati, Ohio

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
Same as box 9.

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

A health hazard evaluation was conducted at the Smithsonian Institution (SIC-8411), Washington, DC in July 1976. Atmospheric samples were collected to measure asbestos (1332214) in ceiling materials at various facilities. Bulk, area, and personal samples were collected. Fibers greater than 5 microns in length were counted. Of the 77 samples, 72 were below analytical limits of detection. Concentrations of the remaining samples ranged from 0.03 to less than 0.01 fibers per cubic centimeter. The percent composition of asbestos was determined in 32 bulk samples, 30 of which were from ceiling scrapings. Asbestos content ranged from nondetectable to approximately 75 percent. The author concludes that it is unlikely that personal exposures pose significant risks. The author recommends vacuuming of areas where fibers could accumulate, sampling for asbestos when environmental conditions of work practices change, and use of appropriate sealants on asbestos ceiling materials. Personal sampling should be conducted during maintenance procedures, adequate respirators should be worn during maintenance, and the ventilation system should be monitored.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms

NIOSH-Publication, NIOSH-Author, NIOSH-Technical-Assistance-Report, Hazards-Unconfirmed, Warehousing, Employee-exposure, Occupational-exposure, Exposure-levels, Dust-exposure, TA-76-063

c. COSATI Field/Group

18. Availability Statement:	19. Security Class (This Report)	21. No. of Pages 16
	20. Security Class (This Page)	22. Price

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

HAZARD EVALUATION AND TECHNICAL ASSISTANCE REPORT NO. TA 76-63

SMITHSONIAN INSTITUTION
WASHINGTON, D.C.

NOVEMBER 1976

Study Requested By:
David A. Billings
Chief of Safety Management Division, Smithsonian Institution

Report Prepared By:
James H. Price
Industrial Hygienist, Hazard Evaluation and Technical Assistance Branch
Division of Surveillance, Hazard Evaluation, and Field Studies
NIOSH

Hazard Evaluation and Technical Assistance Report No. TA 76-63

SUMMARY OF REPORT

On July 12-15, 1976, the Hazard Evaluation and Technical Assistance Branch, National Institute for Occupational Safety and Health, (NIOSH), conducted an environmental survey at the Smithsonian Institution in Washington, D.C. Atmospheric samples were collected to determine possible exposure from asbestos - - present in ceiling material - - at various locations in the History and Technology Museum, Science Information Exchange, Natural History Museum, Silver Hill Complex, and Fine Arts Portrait Gallery.

At all locations where the ceiling material was suspected of containing asbestos, a bulk sample of the material was collected for analysis. The asbestos content for these samples ranged from non-detected to approximately 75 percent, by volume.

A total of 77 air samples were taken, of which 75 were area and 2 were personal. The highest concentration monitored (for fibers greater than 5 microns in length) was 0.03 fibers per cubic centimeter of air, which was well within the present Federal OSHA Standard of 2 fibers per cubic centimeter of air and the proposed OSHA Standard of 0.5 fibers per cubic centimeter of air.

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

HAZARD EVALUATION AND TECHNICAL ASSISTANCE
REPORT NO. TA 76-63

SMITHSONIAN INSTITUTION
WASHINGTON, D.C.

NOVEMBER 1976

INTRODUCTION

On July 12-15, 1976, the Hazard Evaluation and Technical Assistance Branch of the National Institute for Occupational Safety and Health (NIOSH) conducted an industrial hygiene survey at the Smithsonian Institution in Washington, D.C. Atmospheric samples were collected to determine the airborne concentrations of asbestos fiber present in various Smithsonian buildings. The results of these tests in conjunction with observations of employee work practices and procedures were used as criteria to establish guidelines to help insure a healthful work environment.

BACKGROUND

The Safety Management Division of the Smithsonian Institution submitted a request for technical assistance to determine airborne concentrations of asbestos fiber in their facilities. This request stated that several verbal inquiries and written complaints from Smithsonian employees regarding possible exposure to asbestos had been received by their office. There were approximately 30 locations in 5 of their buildings with ceiling material of possible asbestos composition. The buildings included: (1) History and Technology Museum, (2) Science Information Exchange, (3) Natural History Museum, (4) Silver Hill Complex and (5) Fine Arts Portrait Gallery.

METHODOLOGY

Atmospheric samples for asbestos were collected on 0.8 micron (u) pore size mixed cellulose membrane filters with a diameter of 37 millimeters (mm). The filters were encased in three piece plastic cassettes with the face cap removed and the filter completely exposed. Battery powered Mine Safety Appliance* (MSA) gravimetric pumps, Type G, were used to draw air through the filters. The pumps were calibrated and adjusted to operate at 2.0 liters per minute (lpm).

*Mention of commercial names or products does not constitute endorsement by NIOSH.

The methodology consisted of collecting bulk, area, and personal samples for asbestos. In each location where the ceiling material was suspected of containing asbestos, a bulk sample of the material was collected by scraping a portion from the ceiling. Area samples were collected using the aforementioned equipment with the samplers located in areas frequented by employees and in regions where asbestos was believed to be present. For collection of personal samples, the employee wore the pump with the attached filter positioned within his breathing zone. It was anticipated that the asbestos concentrations would be quite low, hence the sampling period ranged from 4 to 8 hours. To insure the proper flowrate was maintained, all pumps were checked periodically during the sampling period.

Analytical work for the samples was completed at the Utah Biomedical Testing Laboratory. The procedure consisted of counting fibers greater than 5u in length at 400-450 magnification, using phase contrast illumination, with the sample mounted in a high-viscosity solution of membrane filter material. Any particle having an aspect ratio of 3 to 1 or greater, was considered to be a fiber.

TOXICOLOGY

Asbestos is a generic term which applies to a number of naturally occuring silicates of variable composition, but basically is of a form of hydrous magnesium silicate. Their chief characteristic is a structure composed of long, parallel, flexible fibers, capable of repeated longitudinal subdivision. The most widely used form in the United States is chrysotile, a fibrous form of serpentine. Other types include amosite, crocidolite, tremolite, anthophyllite and actinolite.

One of the potential health hazards associated with exposure to asbestos is that of inhalation of airborne fibers, resulting in a type of pneumoconiosis referred to as asbestosis. Asbestos fibers are capable of passing through the upper respiratory tract and deposited in the terminal bronchioles of the lungs. The fibers, upon deposition in the terminal bronchioles, initiate a tissue response which results in the coating of the fiber with the ultimate production of what is known as the asbestos "body". If large quantities of the fibers are inhaled over a prolonged period, the tissue reaction progresses until a generalized, diffuse fibrosis becomes evident. This fibrosis is first seen in the lower lobes of the lungs, but eventually if exposure continues, appears in the other lobes as well. The fibrosis can impair the transfer of oxygen across the alveolar membrane and result in respiratory insufficiency, or cardiac failure.

Along with asbestosis, studies have provided conclusive evidence that exposure to asbestos fibers causes cancer in man. The frequency of bronchiogenic cancer is greater in occupationally exposed persons, as well as an increased occurence in development of mesotheliomas of the pleura and peritoneum. These asbestos associated neoplasms may occur without radiological evidence of asbestosis.

FEDERAL STANDARD

Effective July 1, 1976*, the eight hour time weighted average (TWA)** airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 microns, per cubic centimeter (u/cc) of air, with a ceiling value of ten fibers longer than 5 u/cc of air. All determinations of airborne concentrations of asbestos fibers shall be made by the membrane fiber method at 400-450 (4 millimeter objective) with phase contrast illumination.

It should be mentioned that a more stringent standard has been proposed by OSHA for asbestos exposure. The proposed standard would lower the permissible exposure to 0.5 fibers per cubic centimeter of air for an 8-hour TWA, and likewise reduce the permissible ceiling exposure to 5 fibers per cubic centimeter of air for any period not exceeding 15 minutes.***

RESULTS

Seventy-five area and two personal breathing zone samples were collected during the survey. All concentrations measured were within the current OSHA standards for exposure to asbestos, with 72 of the 77 sample results being below the analytical limits of detection (Table 1). The concentrations ranged from a high of 0.03 to less than 0.01 fibers per cubic centimeters of air.

Thirty-two bulk samples were examined microscopically to determine the percent composition of asbestos. Thirty of the samples were ceiling scrapings from the 5 buildings surveyed, one sample was provided from a branch facility in Fort Pierce, Florida, for which the Smithsonian requested an asbestos analysis, and the last sample was taken from a bag of Delta Brown Mud, used as construction material at the Smithsonian Institution. The asbestos content for these samples ranged from non-detected to approximately 75 percent (Table 2).

* Federal Register, 29CFR1910.1001

** TWA - OSHA employee exposure standards are based on a computed time-weighted average (TWA) exposure during any 8 hour shift for a 40 hour work week. The standard represents conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effects.

*** Federal Register, 29CFR1910, Docket No.H.033--Notice of Proposed Rulemaking

DISCUSSION OF RESULTS AND RECOMMENDATIONS

Due to limited employee exposure, the majority of samples collected were area opposed to personal. It should be noted that area samples provide an index of potential exposure and are not entirely indicative of the actual exposure an employee may receive. Such variables as changes in ventilation, air turbulence from body movement, and work practices could influence the amount of asbestos which may become airborne. However, in view of the source of exposure and the low concentrations of asbestos measured, it is unlikely that personal exposures (except in the attic area of the Fine Arts Portrait Gallery) would approach significant levels.

Additional sampling should be conducted at the Fine Arts Portrait Gallery to determine the extent of exposure during maintenance procedures. For approximately 3 hours every 1-2 months, a maintenance man enters the attic area to check and service duct work. Observations of the area indicated considerable quantities of insulation are covering the floor and duct system. Because of the low ceiling height it would require the employee to do extensive crawling. Considering the asbestos content of the insulation and the conditions of the attic, it is conceivable an appreciable exposure could occur.

To help ensure a healthful work environment is maintained, the following recommendations are provided:

All Locations

1. Vacuum clean areas (i.e. floors) where asbestos fiber may accumulate.

2. Sample whenever there are changes in the environmental conditions or work practices which may increase asbestos exposure.

3. Wherever the ceiling material is of asbestos composition, appropriate sealants should be considered for application to help minimize the potential exposure.

Fine Arts Portrait Gallery

1. Conduct personal sampling during maintenance procedures in the attic.

2. Adequate respirator protection should be worn during maintenance procedures unless sampling indicates otherwise.

3. Insure the ventilation system does not become contaminated with asbestos.

References:

1. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Asbestos, 1972.

Authorship and Acknowledgement:

Report Prepared By:

James H. Price
Industrial Hygienist
Hazard Evaluation and Technical Assistance Branch,
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch, Acting Chief
Hazard Evaluation and Technical Assistance Branch,
Cincinnati, Ohio

Acknowledgement:

G. Edward Burroughs
Industrial Hygienist
Hazard Evaluation and Technical Assistance Branch,
Cincinnati, Ohio

TABLE 1

RESULTS OF ENVIRONMENTAL SAMPLING FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

DATE	SAMPLE NUMBER	SAMPLE TIME	LOCATION	FIBERS PER CUBIC CENTIMETER (CC) OF AIR
7-12-76	99	1106-1706	Silver Hill Complex - Bldg.7,Bay 4 (front)	0.03
7-12-76	92	1106-1706	" " " - Bldg.7,Bay 4 (rear)	0.02
7-12-76	96	1106-1706	" " " - Bldg.7,Bay 5 (rear)	0.02
7-12-76	97	1106-1706	" " " - Bldg.7,Bay 5 (front)	<0.01
7-12-76	100	1120-1725	" " " - Bldg.15,Bay 2 (front)	<0.01
7-12-76	89	1120-1725	" " " - Bldg.15,Bay 2 (rear)	<0.01
7-12-76	80	1120-1725	" " " - Bldg.15,Bay 1	<0.01
7-12-76	85	1120-1725	" " " - Bldg.15,Bay 3	<0.01
7-12-76	95	1125-1720	" " " - Bldg.16,Bay 2 (front)	<0.01
7-12-76	84	1125-1720	" " " - Bldg.16,Bay 2 (rear)	<0.01
7-12-76	93	1125-1720	" " " - Bldg.16,Bay 1	<0.01
7-12-76	79	1125-1720	" " " - Bldg.16,Bay 3	<0.01
7-12-76	91	1136-1735	" " " - Bldg.17,Bay 2A(front)	<0.01
7-12-76	81	1140-1735	" " " - Bldg.17,Bay 2A(rear)	<0.01
7-12-76	83	1140-1735	" " " - Bldg.17,Bay 2B(front)	<0.01
7-12-76	76	1136-1735	" " " - Bldg.17,Bay 2B(rear)	<0.01
7-12-76	78	1140-1735	" " " - Bldg.17,Bay 3B	<0.01
7-12-76	87	1136-1735	" " " - Bldg.17,Bay 3A	<0.01
7-12-76	82	1140-1735	" " " - Bldg.17,Bay 1B	<0.01
7-12-76	86	1136-1735	" " " - Bldg.17,Bay 1A	<0.01
7-12-76	94	1129-1735	" " " - Bldg.18,Bay 1	<0.01
7-12-76	90	1129-1735	" " " - Bldg.18,Bay 2(front)	<0.01
7-12-76	77	1129-1735	" " " - Bldg.18,Bay 2(rear)	<0.01

TABLE 1 (CONT'D)

RESULTS OF ENVIRONMENTAL SAMPLING FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

DATE	SAMPLE NUMBER	SAMPLE TIME	LOCATION	FIBERS PER CIBIC CENTIMETER (CC) OF AIR
7-12-76	88	1129-1735	Silver Hill Complex - Bldg.18,Bay 3	<0.01
7-12-76	54	1144-1744	" " " - Bldg.19,Bay 2(front)	<0.01
7-12-76	52	1144-1744	" " " - Bldg.19,Bay 2(rear)	<0.01
7-12-76	71	1144-1744	" " " - Bldg.19,Bay 1	<0.01
7-12-76	98	1144-1744	" " " - Bldg.19,Bay 3	<0.01
7-14-76	57	1015-1615	" " " - Bldg.7,Bay 4 - 5	<0.01
7-14-76	65	1020-1618	" " " - Bldg. 15, Bay 3	<0.01
7-14-76	10	1022-1620	" " " - Bldg. 16, Bay 2	<0.01
7-14-76	11	1026-1622	" " " - Bldg. 17,Bay 2B	<0.01
7-14-76	69	1029-1624	" " " - Bldg. 18,Bay 3	<0.01
7-14-76	5	1032-1622	" " " - Bldg. 19,Bay 2	<0.01
7-13-76	50	0945-1656	Natural History Museum - Attic 438F,South Bay C	<0.01
7-13-76	48	0945-1656	" " " - Attic 438F,South Bay H	<0.01
7-13-76	45	0945-1656	" " " - Attic 438E,North Bay H	<0.01
7-13-76	49	0945-1656	" " " - Attic 438E,North Bay B	<0.01
7-13-76	34	1046-1656	" " " - Attic 438E-F,North Side Above Dinosaur Hall	<0.01
7-13-76	38	1046-1656	" " " - Attic 438E-F,West Side Above Dinosaur Hall	<0.01
7-13-76	37	0956-1655	" " " - Attic 438D,Abott Room	<0.01
7-13-76	36	0957-1655	" " " - Attic 438D Pottery Repair Station	<0.01

TABLE 1 (CONT'D)

RESULTS OF ENVIRONMENTAL SAMPLING FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

DATE	SAMPLE NUMBER	SAMPLE TIME	LOCATION	FIBERS PER CUBIC CENTIMETER (CC) OF AIR
7-13-76	41	1028-1655	Natural History Museum - Attic 438C (front)	<0.01
7-13-76	47	0957-1655	" " " - Attic 438C (rear)	<0.01
7-13-76	39	1035-1655	" " " - Attic 438C-D,Above Hall 10	<0.01
7-13-76	43	1035-1655	" " " - Attic 438C-D,Above Hall 10	<0.01
7-13-76	32	1000-1700	" " " - Attic 438B (front)	<0.01
7-13-76	33	1000-1700	" " " - Attic 438B (rear)	<0.01
7-13-76	40	1032-1700	" " " - Attic 438A (rear)	<0.01
7-13-76	44	1000-1700	" " " - Attic 438A (front)	<0.01
7-13-76	35	1048-1700	" " " - Attic 438A-B, Above Whale Hall	<0.01
7-13-76	42	1048-1700	" " " - Attic 438A-B, Above Whale Hall	<0.01
7-13-76	31	1104-1709	" " " - East Side Cabinet Shop	<0.01
7-13-76	30	1104-1709	" " " - West Side Cabinet Shop	
7-13-76	28	1230-1800	Science Information Exchange - Main Office Area	<0.01
7-13-76	29	1230-1800	" " " Data Processing Room	<0.01
7-14-76	2	0930-1830	History & Technology Museum - Audio Visual Studio	<0.01
7-14-76	64	0930-1830	" " " Audio Visual Equipment Room	<0.01
7-14-76	21	0930-1830	" " " Audio Visual Corridor	<0.01

TABLE 1 (CONT'D)

RESULTS OF ENVIRONMENTAL SAMPLING FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

DATE	SAMPLE NUMBER	SAMPLE TIME	LOCATION	FIBERS PER CUBIC CENTIMETER (CC) OF AIR
7-14-76	15	1030-1805	History & Technology Museum - Room BB015 (front)	<0.01
7-14-76	27	1030-1805	" " " - Room BB015 Lunch Area	<0.01
7-14-76	8*	1030-1455	" " " " - Mechanic in Room BB015	<0.01
7-14-76	20	1128-1818	" " " - Room 4304 West Exterior	0.01
7-14-76	16	1130-1817	" " " - Room 4303, West Exterior	<0.01
7-14-76	23	1132-1820	" " " - Room 4410, Transformer Vault	<0.01
7-14-76	7	1135-1815	" " " - Flaghall Fan Room 4403	0.01
7-14-76	22	1136-1813	" " " - Room 4409 East Interior	<0.01
7-14-76	13	1138-1822	" " " - Room 4507, East Exterior	<0.01
7-14-76	6	1147-1830	" " " - Room CB016, Transformer Vault	<0.01
7-14-76	12	1144-1824	" " " - Room BB030, Transformer Vault	<0.01
7-14-76	25	1151-1827	" " " - Room AB045,	<0.01
7-15-76	4	0757-1430	" " " - Right Side of Loading Dock	<0.01
7-15-76	3	0757-1430	" " " - Left Side of Loading Dock	<0.01
7-15-76	55*	0803-1430	" " " - Mechanic in Room BB015	<0.01

* Denotes personal sample

TABLE 1 (CONT'D)

RESULTS OF ENVIRONMENTAL SAMPLING FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

DATE	SAMPLE NUMBER	SAMPLE TIME	LOCATION	FIBERS PER CUBIC CENTIMETER (CC) OF AIR
7-15-76	56	1100-1625	Fine Arts Portrait Gallery - Elevator Machine Room(NPG)	<0.01
7-15-76	46	1118-1627	" " " " - Attic Above NCFA	<0.01
7-15-76	58	1118-1627	" " " " - Center of Attic	<0.01
7-15-76	14	1142-1628	" " " " - Attic Above Model Hall	<0.01

* Denotes personal sample

TABLE 2

ANALYSIS OF BULK SAMPLES FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

SAMPLE NUMBER	LOCATION	APPROXIMATE PERCENT OF ASBESTOS
2454	Natural History Museum - Cabinet Shop	5
2457	" " " - Attic 438E-F	10
2458	" " " " - Attic 438C-D	2
2459	" " " - Attic 438A-B	5
2455	Science Information Exchange	< 1
2460	Silver Hill Complex - Building 7, Bay 5	50
2461	" " " - Building 7, Bay 4	50
2462	" " " - Building 17,(back)	50
2463	" " " - Building 17, (front)	10
2464	" " " - Building 19	75
2465	" " " - Building 18	75
2466	" " " - Building 16	5
2467	" " " - Building 15	5
2468	Fine Arts Portrait Gallery - Elevator Machine Room (HPG)	20
2469	" " " " - Attic above NCFA	30
2470	" " " " - Machine Room (NPG side)	20
2471	" " " " - Library Attic	25
2472	" " " " - Attic over Model Hall	30
2473	History & Technology Museum - Transformer Vault AB045	50
2474	" " " - Transformer Vault BB030	30
2475	" " " - Transformer Vault CB016	10
2476	" " " - Transformer Vault Room 4410	20
2477	" " " - East Exterior Fan Room 4507	25
2478	" " " - East Interior Fan Room 4409	25

TABLE 2 (CONT'D)

ANALYSIS OF BULK SAMPLES FOR ASBESTOS

July 12-15, 1976
Smithsonian Institution
Washington, D.C.

SAMPLE NUMBER	LOCATION	APPROXIMATE PERCENT OF ASBESTOS
2479	History & Technology Museum - Flag Hall Fan Room 4403	25
2480	" " " - West Interior Fan Room 4303	50
2481	" " " - West Exterior Fan Room 4304	50
2482	" " " - Audio Visual Studio	25
2483	" " " - Loading Dock	25
2484	" " " - Room BB015 COM	30
2485	Fort Pierce Facility	0
2456	Delta Brown Mud	<1