U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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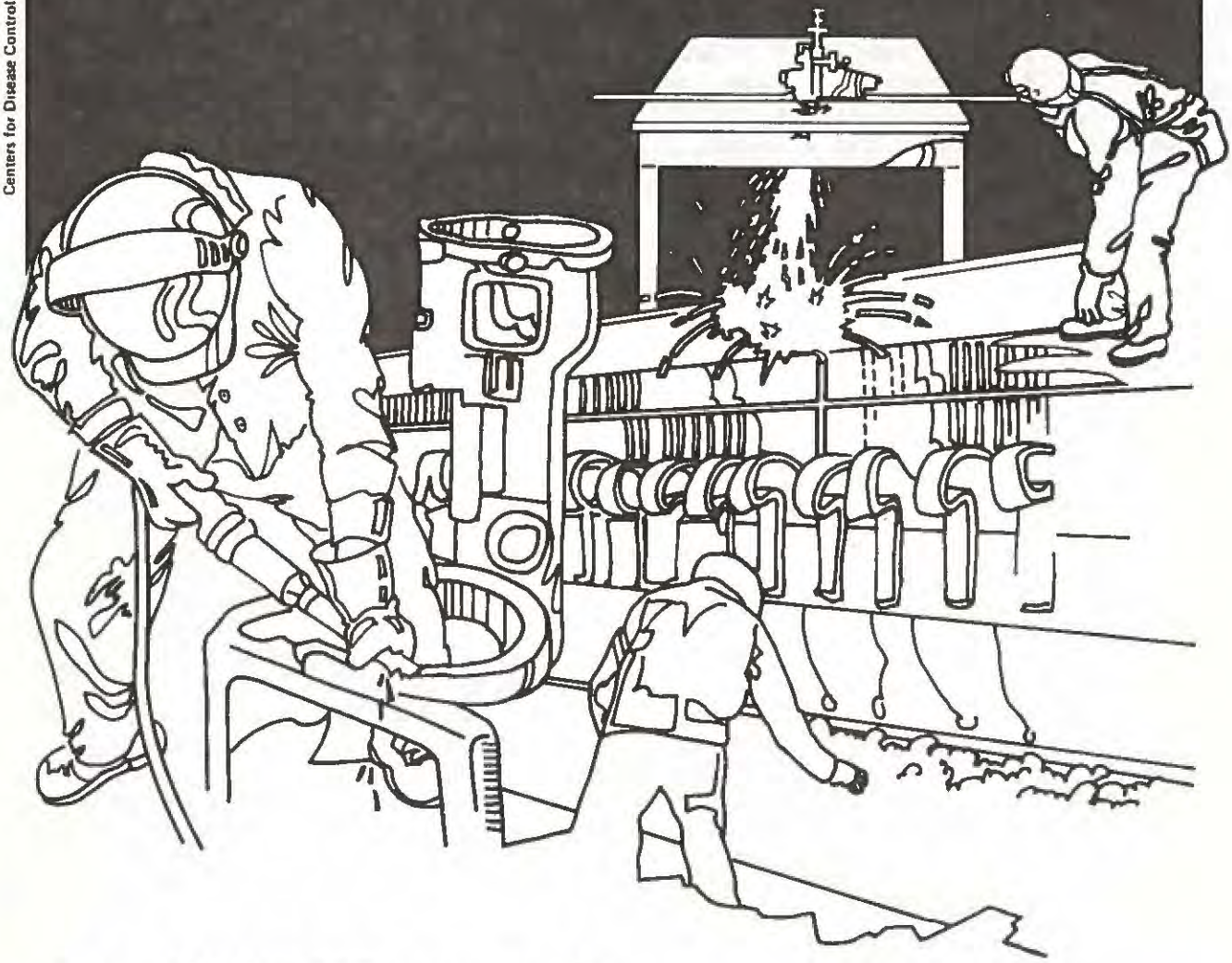
NIOSH



Health Hazard Evaluation Report

HETA 83-450-1468
GEORGE ROGERS CLARK NATIONAL
HISTORICAL PARK
VINCENNES, INDIANA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from 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.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 83-450-1468
May 1984
GEORGE ROGERS CLARK NATIONAL HISTORICAL PARK
VINCENNES, INDIANA

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I. SUMMARY

On September 22, 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate exposures to asbestos during maintenance activities at the George Rogers Clark National Historical Park, Vincennes, Indiana. Previous surveys by the National Park Service had identified asbestos containing materials to be present in insulation covering the heating pipes and ventilation ducts in the basement and in a roof tunnel of the monument. In November 1983, an industrial hygiene survey was conducted. Five bulk samples of the insulation were collected for asbestos identification and five area air samples were collected for quantitative asbestos analysis. The air samples collected were representative of a normal working day, with a normal level of worker activity.

All five bulk insulation material samples contained chrysotile asbestos ranging from 20% to 50%. Three of these samples also contained crocidolite asbestos ranging from 10% to 30%, and one sample contained amosite asbestos ranging from 1% to 2%. No airborne asbestos was detected in the 5 general area air samples above the limit of detection of the analytical method used (approximately 0.01 fiber/cubic centimeter).

Based on evidence indicating that asbestos is a human carcinogen, NIOSH recommends that exposure be controlled to the lowest feasible levels. The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) presently enforced is 2.0 fibers/cubic centimeter as an 8-hour time weighted average (TWA).

Although the insulation material contained high percentages of asbestos, the environmental sampling did not indicate quantifiable airborne fiber levels. Due to the small amount of time that maintenance employees normally spend in the areas where asbestos is present, the possibility of exposure would be greatly minimized. However, the potential for asbestos exposure does exist if maintenance or remodeling work disturbs the insulation material. In such instances, proper removal procedures and personal protection should be implemented. Since renovation of the heating and ventilation system is planned for the near future, these operations should be conducted in accordance with existing guidelines and regulations.

Based on the data collected during this survey, it has been determined that a health hazard did not exist at the time of the survey. In order to minimize the risk of exposure during any future maintenance or removal activities on the asbestos containing insulation materials, guidelines are provided in Appendix 1 and 2 of the report.

KEYWORDS: SIC 8411 (Museums and Art Galleries), asbestos, amosite, chrysotile, crocidolite, insulation.

II. INTRODUCTION

On September 22, 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized representative of the U.S. Department of the Interior, National Park Service at the George Rogers Clark National Historical Park, Vincennes, Indiana. The requestor was concerned with the potential health hazard of asbestos present in insulation covering the heating pipes and ventilation ducts in the basement and roof tunnel of the memorial building.

On November 9, 1983, an industrial hygiene survey was conducted by NIOSH. Bulk and general area air samples were collected to determine the presence of asbestos in the areas of concern. The requestor was notified of the results of the environmental samples by letter on March 13, 1984.

III. BACKGROUND

In the mid 1920s, during the 150th anniversary of the American Revolution, interest in commemorating the great accomplishments of George Rogers Clark grew in Vicennes, Knox County, and the State of Indiana. At that time the site of Fort Sackville, captured by Clark, was covered by a warehouse, grain elevator, feed mill, and boarding houses.

As the commemorative proposals gained momentum, Congress created the George Rogers Clark Sesquicentennial Commission to construct an impressive memorial that would be in keeping with the contributions of Clark and the American frontiersmen. The magnificent plans of Fredrick Hirons won a national architectural competition, and construction of the memorial began in 1931.

The stately and imposing structure was completed in 1933. Built in the classic Greek style, the building is encircled by sixteen massive pillars. The exterior of the memorial is granite, the interior limestone and marble. Seven large murals in the interior were painted by artist Ezra Winter and depict important facets of Clark's campaign and its far-reaching results. A bronze statue of this military hero of the frontier, sculpted by Hermon A. MacNeil, stands in the center of the rotunda.

Soon after work on the memorial started, development of the extensive walks and grounds commenced. The approach to the Indiana side of the Lincoln Memorial Bridge, which was being constructed at that time, was incorporated into the formal landscaping. Statues of Francis Vigo and Father Pierre Gibault, both of whom had played an important role in the Clark campaign, were also placed on the grounds.

The Clark Memorial was dedicated by President Franklin D. Roosevelt on June 14, 1936, in a ceremony attended by thousands. During the following years, the site was administered by the State of Indiana until designated a unit of the National Park System, as the George Rogers Clark National Historical Park, in 1966.[1]

As a result of an inspection conducted by the Park Service in September 1983, it was learned that the insulation material covering heating pipes and ventilation ductwork in the basement and roof tunnel areas of the monument contained varying amounts of asbestos. Access to both of these areas is limited only to the maintenance personnel of the Park Service. Two employees are required to enter the boiler room in the basement of the monument for short periods of time (5 to 10 minutes) on a daily basis. The roof tunnel of the building is entered by a maintenance employee approximately once every other month. Some deterioration and water damage was noted on insulation material covering ductwork in the basement area directly beneath the monument, but employees are not usually required to enter this area.

IV. EVALUATION DESIGN AND METHODS

Five general area samples for airborne asbestos were collected in and around the Clark Memorial building using battery-powered sampling pumps operating at a flow rate at 1.5 liters per minute (LPM) attached via Tygon® tubing to mixed cellulose ester membrane filters, mounted in open-faced cassettes. The samples were analyzed according to NIOSH Method P&CAM. 239[2] utilizing Phase Contrast Microscopy.

The limit of detection (LOD) has been determined to be 0.03 fiber/field or 4500 fibers/filter. A detection limit is calculated by dividing the minimum observable fibers by the maximum number of fields specified by the method. It should be noted that the reported LOD is lower than that cited within the previously quoted NIOSH method.

Five bulk samples were collected from representative locations described in Table 1 and analyzed for percent and type asbestos as follows. All samples were examined for homogeneity. Non-homogeneous samples were ground manually to insure homogeneity.

Microscope slides are prepared from each sample using 1.55 refractive index liquid. The slides are then examined for the presence of asbestos utilizing polarized light microscopy and dispersion staining techniques. A Leitz Dialux 20 microscope equipped with a 16x objective and a 10x eyepiece is used for the analysis.

The percentage of asbestos is estimated microscopically by a visual examination of the fibers with an aspect ratio of 3:1 or greater. If present, asbestos identities are confirmed with the appropriate refractive index liquids applying dispersion staining techniques.

All samples are examined by two separate analysts. Results are averaged and reported in percent by volume.

V. EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ enviromental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are manintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general enviroment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criteria. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's) and 3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8-to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

Asbestos has been widely used in building materials for fireproofing, thermal and acoustical insulation and decoration. The potential for release of fibers from these materials depends in part upon the characteristics of material that contains the asbestos fibers. Soft, crumbly materials tend to release fibers more easily than do hard, cementitious materials. The soft, crumbly material is defined as friable; material that when dry may be crumbled, pulverized or reduced to powder by hand pressure. Asbestos fibers are extremely durable, and their size and shape permit them to remain airborne for long periods of time. Fibers become suspended in the air by disturbance of the friable asbestos-containing materials or deterioration causing the material to release fibers, and by resuspension of previously released fibers that have settled onto floors and other surfaces.

Inhalation of asbestos dust can result in serious and irreversible diseases. It has been causally associated with lung cancer, a rare cancer of the chest and abdominal lining called mesothelioma and cancers of the esophagus, stomach, colon and other organs.[3] Inhalation also causes asbestosis, a non-malignant, progressive, irreversible lung disease caused by the inhalation of asbestos dust.[4]

There is typically a period of many years between initial exposure and the appearance of asbestos related disease. Available data show that the lower the exposure, the lower the risk of developing asbestosis and cancer. Excessive cancer risks, however, have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or "safe" level of asbestos exposure.[5]

The NIOSH-recommended criterion for asbestos is to reduce exposure to the lowest feasible limit; the lowest reliable detectable limit for the environmental and analytical methodology used in this evaluation is in the range of 0.01 fiber/cubic centimeter(cc), TWA. The OSHA permissible exposure limit (PEL) presently enforced is 2.0 fibers/cc as an 8-hour TWA. The ACGIH TWA-TLV's for asbestos as determined by the membrane filter method at 400-450X magnification (4 mm objective) phase contrast illumination are: amosite 0.5 fiber/cc, chrysotile 2 fibers/cc and crocidolite 0.2 fiber/cc and other forms 2 fibers/cc (all fibers greater than 5 um in length).

VI. RESULTS AND CONCLUSIONS

All five bulk insulation material samples contained chrysotile asbestos ranging from 20% to 50%, three of the bulk samples also contained crocidolite asbestos ranging from 10% to 30%, and one sample also contained amosite asbestos ranging from 1% to 2%. The results are presented in Table I.

No airborne asbestos was detected on the 5 general area air samples above the limit of detection of the analytical method used. The locations from which these samples were collected are presented in Table II.

Although the insulation material contains high percentages of asbestos and some of it has deteriorated because of water damage, due to the inaccessibility of most of the areas where the insulation is present and the low occupancy factor (i.e. low potential for employee exposure), and the negative environmental sampling results, it is concluded that a health hazard did not exist at the time of the survey on November 9, 1983. However, the potential for a health hazard is present, and should maintenance or remodeling work require disturbing the insulation material, proper removal procedures should be exercised. Renovation of the heating and ventilation system is planned for the near future. At such time, the asbestos containing insulation material is scheduled to be removed.

Both OSHA and EPA have regulations for the removal of asbestos containing material. The OSHA regulations are contained in the Code of Federal Regulations, Title 29, Part 1910. The EPA regulations are contained in Title 40, Part 61 of the Code of Federal Regulations.

Asbestos stripping procedures are outlined in Appendix 1 and 2 to this report.[3,4] Removal of the insulation material is a permanent solution to the potential problem.

VII. REFERENCES

1. Eastern National Park and Monument Association, Publication: George Rogers Clark National Historical Park.

2. National Institute for Occupational Safety and Health, NIOSH Manual of Analytical Methods, Vol 1, 2nd ed., (DHEW)(NIOSH) Publication No. 77-157-A), 1977.

3. Asbestos Containing Materials in School Buildings: A Guidance Document, Parts 1 & 2, United States Environmental Protection Agency, EPA Publication No. 770294.

4. Michaels, L., Chrisick, S., Asbestos, Properties, Applications and Hazards, Vol 1, John Wiley and Sons, 1979.

5. Workplace Exposure to Asbestos, DHHS (NIOSH) Publication No. 81-103, 1980.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal Springfield, Virginia 22161. 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:

1. Superintendent, George Rogers Clark National Historical Park
2. NIOSH, Region V
3. OSHA, Region V

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

Table I

Results of Bulk Insulation Samples Collected for Asbestos
George Rogers Clark National Historical Park
Vincennes, Indiana
HETA 83-450
November 9, 1983

Sample Location	Chrysotile Asbestos	Crocidolite Asbestos	Amosite Asbestos
Boiler room, pipe on boiler	40-50%		
Pipe in roof tunnel	30%	10-20%	1-2%
Material fallen from ducting, on dirt under rotunda	40%		
Pipe in hall near boiler room	20%	30%	
Material fallen from piping, boiler room floor	20-30%	20-30%	

TABLE II
Results of General Area Air Samples for Asbestos
George Rogers Clark National Historical Park
Vincennes, Indiana
HETA 83-450
November 9, 1983

Sample Location	Sampling Period (hours)	Sample Volume (liters)	Asbestos Concentration (fibers/cc)[a]
Monument basement, boiler room	0754-1247	586	<LOD[b]
Inside basement entry, near door	0800-1248	576	<LOD
In basement, under rotunda	0803-1245	423	<LOD
In tunnel to roof, above rotunda	0828-1243	510	<LOD
On roof, above visitors center	0839-1305	532	<LOD

[a] - Concentrations of asbestos are reported in fibers greater than 5um in length per cubic centimeter of air (f/cc).

[b] - LOD = Limit of Detection (The detection limit was 4500 fibers/filter or approximately 0.01 f/cc).

Appendix 1

ASBESTOS STRIPPING PROCEDURES[3,4]

1. Notify EPA of intention to remove, demolish or renovate asbestos at least 20 days prior to commencement [40 CFR 61-11(d)]

2. Survey the job and draw up an operational plan considering :

   a) The means for sealing off the work area.

   b) Method of transporting asbestos waste from the work area, through the barriers to transportation.

   c) Identify locations and provisions for change rooms, toilet, and showering facilities.

   d) Choice of protective equipment. (29 CFR 1910.134)

   e) Contamination control procedures.

   f) Identification of sanitary land fill.

   g) Ventilation openings, drains, etc, to be sealed or filtered.

   h) Water and electrical services.

   i) Monitoring facilities and frequency of sampling.

   j) Identification of the equipment to be covered/removed.

   k) Provisions for maintenance.

   l) Security system.

3. Air sampling to determine background fiber levels.

4. Begin operation by removing designated equipment. Cover remaining equipment and hard to clean surfaces with PVC or polyethylene sheet. Seal openings, such as windows, doors, ventilation systems, etc.

5. Seal off the area with PVC or polyethylene sheet. Overlap joints and heat seal or tape. If the area to be stripped is large, it should be compartmentalized. Access into the work zone must be through an air lock system which may be incorporated into the changing and washing facilities. The work area should be kept below atmospheric pressure with an exhaust fan equipped with an absolute filter. Floors should also be covered.

6. The barrier, air lock system should be constructed so that the worker passes from the work zone into successively cleaner areas, e.g., work zone to vacuum to asbestos clothing change room to shower room to personal clothing change room to external unrestricted area.

7. Asbestos removal: Water spraying with respraying as required. If dust occurs during removal of the material by dislodgement and scraping, the water should be amended with a wetting agent. Dry stripping requires EPA approval. [40 CFR 61.22 (d) (ii)].

8. Air sampling inside and outside the work zone should be conducted to insure that the barriers are effective and to confirm the suitability of the respirators.

9. The asbestos stripped should be caught and not allowed to fall to the floor, if possible. Asbestos should be bagged and labeled according to OSHA regulations using 6 mil or heavier plastic bags. The use of 55 gallon drums is strongly recommended as a secondary containment for the bags. Material should not be allowed to accumulate and none should be wiped down before removal.

10. All of the surfaces should be washed down or vacuumed after stipping and removal is completed. Work should progress from the top to the bottom.

11. It is virtually impossible to remove all of the asbestos and once the stripping is completed, but before the barriers are removed, the surfaces should be coated with a sealant. An emulsion type paint is acceptable.

12. Air sampling should be performed before removal of the barriers and thereafter over an extended period of time to insure that effective control has been provided.

13. Dismantel the barriers and dispose in a landfill.

APPENDIX 2

GUIDELINES FOR REDUCING ASBESTOS EXPOSURE[3,4]

1. The ventilation system should be turned off and remain off until the work is completed and the area has been cleaned.

2. Whenever asbestos containing material must be handled, an approved respirator should be worn. (29 CFR 1910.134)

3. Make sure that only those persons who are necessary for the job are in the area.

4. Place a plastic drop cloth below the work area.

5. Spray the asbestos containing material with water before it is disturbed.

6. Put all the asbestos removed into a heavy plastic bag, label it and send to the landfill.

7. After the job is completed, clean all the ladders and tools used with a wet cloth.

8. Roll up the dropcloth carefully and put it in a plastic bag. Discard the bag.

9. Clean the floor below the work area with a wet mop.

10. Put the mop head and the cloth used to clean the ladders in a plastic bag while they are still wet, seal the bag, and discard it.

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