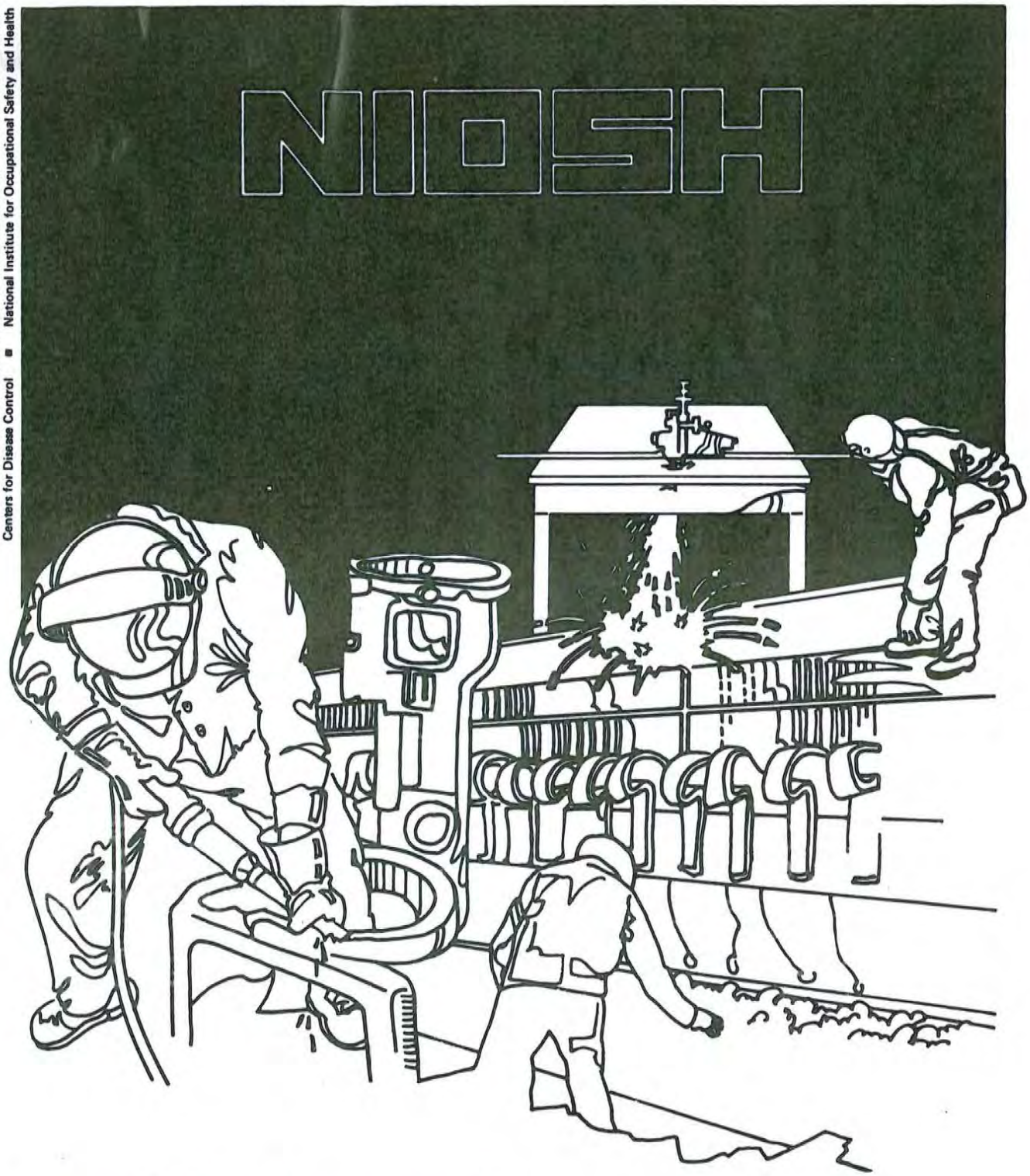
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public h. ervice
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

HETA 83-189-1368
GOODYEAR AEROSPACE CORP.
AKRON, OHIO

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 nygiene 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.

HETA 83-189-1368
SEPTEMBER 1983
GOODYEAR AEROSPACE CORPORATION
AKRON, OHIO

NIOSH INVESTIGATOR:
Raymond L. Ruhe, I.H.

I. SUMMARY

In March, 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request for a Health Hazard Evaluation at Goodyear Aerospace Corporation, Akron, Ohio. NIOSH was requested to determine the presence of asbestos in the ceiling and wall insulation in Plant F. On April 21, 1983, an industrial hygiene survey was conducted by NIOSH. Five personal and five area samples were collected for asbestos analysis. Three bulk samples of the insulation were collected for asbestos identification.

Asbestos was detected in 2 of 5 personal and 3 of 5 area air samples; concentrations ranged from less than detectable limits to 0.04 fibers/cubic centimeter (fiber/cc 8-hour time weighted average (TWA). The NIOSH-recommended criterion for asbestos is to reduce exposure to the lowest feasible limit. The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) presently enforced is 2.0 fibers/cc 8-hour TWA. The three bulk insulation material samples contained amosite asbestos ranging from 60% to 85%, chrysotile asbestos greater than 1%, and glass wool 3% to 5%.

Based on the environmental sample results, NIOSH concludes that a potential health hazard did exist at the time of this survey on April 21, 1983. NIOSH recommends that the asbestos containing insulation material be removed due to its deterioration and friable nature. Proper removal procedures are listed in Appendix 1 and 2. These procedures must be followed in order to prevent an exposure problem.

KEYWORDS: SIC 1990 (Ordinance and Accessories), asbestos, amosite, chrysotile, insulation.

II. INTRODUCTION

In March 1983, NIOSH received a request from the Local Union #856 United Auto Workers of America at Goodyear Aerospace Corporation, Akron, Ohio, to determine the possible presence of asbestos in the ceiling and wall insulation in Building F. On April 21, 1983 an industrial hygiene survey was conducted.

III. BACKGROUND

Goodyear Aerospace Corporation at Akron, Ohio produces defense systems hardware, gas centrifuges for uranium enrichment, aircraft wheels, tire products, and brakes, as well as other materials used by the aerospace industry.

Plant F develops and manufactures experimental disc brake and die assembly machines for the power press room. The machine operators machine carbon, aluminum, magnesium, and steel fibers produced in Plant F.

IV. EVALUATION DESIGN AND METHODS

Five personal and five area samples for airborne asbestos were collected in Plant F, on mixed cellulose ester membrane filters, mounted in open-faced cassettes using a battery-powered vacuum pump operating at a flow rate at 1.5 liters per minute (LPM). The samples were analyzed using phase contrast microscopy according to NIOSH method P&CAM.[1]239.

The 10 AA filters were prepared for Electron Microscopy Analysis (EM) via the Zumwalde-Dement procedure outlined in NIOSH Publication 77-204[2]. The samples were analyzed at a microscope setting of 10,000 x magnification. Energy dispersive x-ray analysis (EDXA) and selected area electron diffraction (SAED) analyses were performed on all fibers present in ten grid openings.

Representative portions of the three bulk samples were observed under the stereomicroscope at 100x magnification to ascertain the various components in the sample. Portions of each bulk sample were also immersed in Cargille refractive index liquids equal to 1.550 and 1.605 and analyzed by Polarized Light Microscopy (PLM) at 400x magnification. The bulk samples were also analyzed by Electron Microscopy (EM). Portions of each sample were ultrasonicated in ethyl alcohol and aliquots of the resulting suspension were evaporated onto 200 mesh carbon-coated copper grids. Each grid was scanned at 2000x magnification. EDAX analysis and SAED analysis (where sample orientation permitted) were performed at 10,000x magnification.

V. EVALUATION CRITERIA

A. Environmental Criteria

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental 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 maintained 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 environment, 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 criterion. 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 (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 solely 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.

1. Asbestos

Asbestos has been widely used in builing 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 reduce 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 analytical method generally available is 0.1 Fiber/cc TWA. The OSHA PEL presently enforced is 2.0 fibers/cc 8-hour TWA.

VI. RESULTS AND CONCLUSIONS

Three bulk samples of insulation contained amosite asbestos ranging from 60% to 85%, chrysotile asbestos was greater than 1%, and glass wool ranged from 3% to 5%. The results are presented in Table I.

Results of the air samples collected for asbestos are presented in Table II. Asbestos concentrations (for 10 samples) ranged from less than detectable to 0.04 fibers/cc 8-hour TWA.

The NIOSH criteria is 0.1 fibers/cc 8-hour TWA. Since asbestos is a carcinogen, NIOSH policy is to reduce to the lowest feasible limit. The OSHA standard is 2.0 fibers/cc 8-hour TWA.

Friable asbestos containing material has been used on the walls and ceiling throughout Plant F. This material is encapsulated with a coating. The coating acts as a sealant to prevent fiber release. However, the friable material is in poor condition and accessible to contact damage. The coating is not effective at preventing fiber release when damaged. It is recommended that the friable material be removed from the plant. Removal of the material must follow stringent work practices to prevent a greater exposure problem than it seeks to eliminate.

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. Removal of this friable material is a permanent solution to the problem.

Based on the environmental sample results, NIOSH concludes that a potential health hazard did exist at the time of this survey on April 21, 1983. NIOSH recommends that the asbestos-containing insulation material be removed due to its deterioration and friable nature.

VII. REFERENCES

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

2. National Institute for Occupational Safety and Health. Review and Evaluation of Analytical Methods for Environmental Studies of Fibrous Particulate Exposure. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1977 (DHEW Publication No. 770294).

3. Asbestos Containing Materials in School Buildings: A Guidance Document. Parts 1 & 2. United States Environmental Protection Agency. Publication No. EPA-450/2-78-014.

4. Michaels, L., Chrssick, 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

Report Prepared by:	Raymond L. Ruhe Industrial Hygienist Industrial Hygiene Section
Originating Office:	Hazard Evaluations and Technical Assistance Branch Division of Surveillance, Hazard Evaluations, and Field Studies
Report Typed By:	Betty C. Williams Clerk-Typist Industrial Hygiene Section

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. Local 856, United Auto Workers, Akron, Ohio
2. Goodyear Aerospace Corporation, Akron, Ohio
3. NIOSH, Region V
4. 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

Goodyear Aerospace Corporation
Akron, Ohio
HETA 83-189

April 21, 1983

Location	Amosite Asbestos	Chrysotile Asbestos	Glass Wool
Between I-Beams C-13-14	70-80%	>1%	3-5%
Coating Room	75-85%	>1%	3-5%
From Wall at D-16 I-Beam	60-75%	>1%	3-5%

TABLE II

Results of Personal and Area Samples for Asbestos

Goodyear Aerospace Corporation
Akron, Ohio
HETA 83-189

April 21, 1983

Job and/or Location	Sampling Period	Sample Volume Liters	Asbestos Concentration (fibers/cc)
Machinist	0727-1500	679	0.04
Tool and Die Maker	0732-1504	678	0.02
Inspector	0740-1505	667	L.D.*
Mill Operator	0745-1507	663	L.D.
Burr Filer	0750-1508	657	L.D.
Area South of I-Beam C-2	0758-1512	651	L.D.
Area Between I-Beam A4-A5	0803-1514	646	0.02
Area I-Beam A-8	0806-1515	643	0.02
Area Dispatcher Office	0813-1516	634	0.02
Area Coating Room	0814-1520	639	L.D.

Present OSHA Standard
2.0 f/cc - 8-hour TWA
10.0 f/cc - 15-minute ceiling

Recommended NIOSH Standard
Lowest feasible limit

Concentrations of asbestos are given in fibers greater than 5u in length per cubic centimeter of air (f/cc).

Limit of detection used by the laboratory was 0.01 f/cc

*L.D. - Less than detectable limits

APPENDIX 1

ASBESTOS STRIPPING PROCEDURES

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 of 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 polyethelene sheet. Seal openings, such as windows, doors, ventilation systems, etc.

5. Seal off the area with PVC or polyethelene 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 area 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 ammended 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 left unbarrelled at the end of the day. Bags and drums must be wiped down before removal.

10. All of the surfaces should be washed down or vacuumed after stripping 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

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.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ROBERT A. TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE. $300

Third Class Mail

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF HHS
HHS 396