LINDE
UNION CARBIDE

INTERNAL
CORRESPONDENCE

Old Ridgebury Road, Danbury, Connecticut 06817

00002

To N. E. Bolton/L. E. Barron
J. M. Cleverdon
S. H. Henry
D. L. Heywood
T. V. Kelly
A. J. Hart/R. D. Ondocsin

Date November 5, 1982

Originating Dept SH&EA (R-4)

Subject TSCA Section 8(a) - Asbestos

PLAINTIFF'S EXHIBIT
UC-840

Attached for your file is a copy of the Engineering Products' subject report. This report, along with the Metal Division's report, will be submitted by J. B. Browning to the EPA.

Eleanor K. Jensen

Eleanor K. Jensen

EKJ/mbb
Attachment

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O.M.B. No. 2000-0479: Approval Expires June 30, 1985

United States Environmental Protection Agency

REPORTING COMMERCIAL AND INDUSTRIAL USES OF ASBESTOS

When completed send this form to:

U.S. Environmental Protection Agency
P.O. Box 2070
Rockville, MD 20852

Please read the accompanying instruction booklet before completing this form. Note that a separate form must be submitted for each plant site, except that total imports or exports of bulk asbestos may be reported in a consolidated corporate report. The instructions provide further directions.

When this form is complete, enclose it in the preaddressed envelope provided. Should you have any questions, please contact the Industry Assistance Office toll-free at (800) 424-9065 or in Washington, D.C. at (202) 554-1404.

All persons who are solely secondary processors, importers of asbestos mixtures, or importers of articles containing asbestos components will report in the first phase on EPA Form 7710-37, titled "Secondary Processing and Importation of Asbestos Mixtures." These persons will report in this form, EPA Form 7710-36, only upon receipt of notice to that effect from EPA (see 40 CFR 763, part D).

A(1). RESPONDENT IDENTIFICATION

1. Company name: Union Carbide Corporation - Engineering Products Division
Plant site name: Speedway Factory
Address (Number and street): 4801 West 16th Street
City: Indianapolis | County: Marion | State: Indiana | ZIP code: 46224

2. Principal technical contact person — Name: Thomas V. Kelly | Job title: Safety Director | Office telephone (Area code, number, extension): (317) 240-2307

3. *If applicable* — Record mine identification number —— Not Applicable

4. *If applicable* — Record the name and address of the parent corporation which is responsible for the fiscal management of the reporting site.

Name of parent corporation: Union Carbide Corporation
Address (Number and street): Old Ridgebury Road
City: Danbury | County: Fairfield | State: Connecticut | ZIP code: 06817

5. Record the total number of years during which the manufacture and/or processing of asbestos has been conducted at the reporting site. —— Number of years: Approx. 70

A(2). RESPONDENT ACTIVITY

6. Identify your activity from the definitions in the instruction booklet and mark (X) the box next to the category below that best describes your activity(ies). Mark (X) next to all activities that you are reporting on this form. You must at least complete the portions of this report that are indicated next to the box you mark, and you must complete other sections if you conduct that activity. For example, if at the same plant site you process bulk asbestos to produce an asbestos mixture and you also process an asbestos mixture that is made at another location, then you as a primary processor must also complete part D as a secondary processor.

All persons who are miners, millers, primary processors, or importers of bulk asbestos must report their asbestos activities at all plant sites.

Mark (X) your activity(ies) that is reported on this form.

- ☐ Mine and mill — Complete parts A, B(1), G, H, I, J, K [B(3), if applicable]
- ☒ Primary processor — Complete parts A, C, G, H, I, J, K [B(3), if applicable]
- ☐ Importer of bulk asbestos — Complete parts A, B(2) [B(3), if applicable]
- ☐ Secondary processor — Complete parts A, D, G, H, I, J, K
- ☐ Importer of asbestos mixtures — Complete parts A and E
- ☐ Importer of article(s) containing asbestos component(s) — Complete parts A and F

A(3). CERTIFICATION FOR CLAIMS OF CONFIDENTIALITY

You may claim as confidential any information you submit on this form. The instructions provide specific instructions on how to assert claims of confidentiality. For information which you submit in attachments to the form, provide a copy which clearly indicates the information you wish to claim confidential.

Space is provided at the end of each line to claim information on that line confidential.

For any information on this form you claim as confidential, you must certify that the information is confidential. The signature below will attest to the truth and accuracy of the following statements. All four statements must be true about any information you claim confidential.

1. My company has taken measures to protect the confidentiality of the information, and it will continue to take these measures.
2. The information is not, and has not been, reasonably obtainable by other persons (other than governmental bodies) by using legitimate means (other than discovery based on a showing of special need and in a judicial or quasi-judicial proceeding) without my company's consent.
3. The information is not publicly available.
4. Disclosure of the information claimed as confidential would cause substantial harm to my company's competitive position.

7. Signature of authorized official: J M Clevenden — Date: Nov 1, 1982

B(1). PRODUCTION OF BULK ASBESTOS

QUANTITY OF BULK ASBESTOS MINED OR MILLED

Enter, in short tons, the amount of bulk asbestos you produced (mined or milled) for 1979 through 1981.

Year	Report in short tons: Chrysotile	Crocidolite	Amosite	Anthophyllite asbestos	Tremolite asbestos	Actinolite asbestos	Confidential Mark (X)
1979	N/A						
1980							
1981							

B(2). IMPORTATION OF BULK ASBESTOS

QUANTITY OF BULK ASBESTOS IMPORTED

Enter, in short tons, the amount of bulk asbestos you imported for 1979 through 1981.

Mark (X) one: ☐ This is a corporate consolidated report. ☐ This is a plant site report.

Year	Report in short tons: Chrysotile	Crocidolite	Amosite	Anthophyllite asbestos	Tremolite asbestos	Actinolite asbestos	Confidential Mark (X)
1979	N/A						
1980							
1981							

B(3). EXPORTATION OF BULK ASBESTOS

QUANTITY OF BULK ASBESTOS EXPORTED

Enter, in short tons, the amount of bulk asbestos you exported for 1979 through 1981.

Mark (X) one: ☐ This is a corporate consolidated report. ☐ This is a plant site report.

Year	Report in short tons: Chrysotile	Crocidolite	Amosite	Anthophyllite asbestos	Tremolite asbestos	Actinolite asbestos	Confidential Mark (X)
1979	N/A						
1980							
1981							

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C. PRIMARY PROCESSOR PRODUCTION

Enter the following information for each type of end product that you shipped from your plant site. Classify your end products according to the list below

End product shipped (Enter one end product per line) (1) Code number	Generic name	Type of asbestos fiber (Use one line per mineral type) (2)	Year	Quantity of asbestos consumed (Short tons) (3)	Total annual production (4) Quantity	Unit of measure	Value shipped (Thousands of dollars) (5) Domestic	Exports	Confidential Mark (X)
34	Acetylene Cylinder	☒ Chrysotile ☐ Anthophyllite	1979	240.0	220,000	Each	11,800	1,700	X
		☐ Crocidolite ☐ Tremolite	1980	105.6	157,000	Each	10,000	1,900	X
		☐ Amosite ☐ Actinolite	1981	105.6	140,000	Each	9,600	1,400	X
	☐ Continued	☐ Chrysotile ☐ Anthophyllite	1979						
		☐ Crocidolite ☐ Tremolite	1980						
		☐ Amosite ☐ Actinolite	1981						
	☐ Continued	☐ Chrysotile ☐ Anthophyllite	1979						
		☐ Crocidolite ☐ Tremolite	1980						
		☐ Amosite ☐ Actinolite	1981						

(6) Estimate the percentage of the total value shipped from the plant site reported here as primary processor production in 1981 — 25 %

Asbestos Mixture Product Subcategories

Papers, felts, or related products — Unit of measure
- 01. Commercial paper — Short tons
- 02. Roll board — Short tons
- 03. Millboard — Short tons
- 04. Pipeline wrap — Short tons
- 05. Beater-add gasketing paper — Short tons
- 06. High-grade electrical paper — Short tons
- 07. Unsaturated roofing felt — Short tons
- 08. Saturated roofing felt — Short tons
- 09. Flooring felt — Short tons
- 10. Corrugated paper — Short tons
- 11. Specialty paper (Specify generic name) — Short tons

Floor coverings
- 12. Vinyl-asbestos floor tile — Square yards
- 13. Asbestos-felt-backed vinyl flooring — Square yards

Asbestos-cement products — Unit of measure
- 14. A/C pipe and fittings — Short tons
- 15. A/C sheet, flat — 100 sq. ft
- 16. A/C sheet, corrugated — 100 sq. ft
- 17. A/C shingle — Squares

Friction materials
- 18. Drum brake lining (light-medium vehicle) — Pieces
- 19. Disc brake pads (light-medium vehicle) — Pieces
- 20. Disc brake pads (heavy vehicle) — Pieces
- 21. Brake block (heavy equipment) — Pieces
- 22. Clutch facings (all) — Pieces
- 23. Automatic transmission friction components — Pieces
- 24. Friction materials (industrial and commercial) — Pieces

Textiles — Unit of measure
- 25. Cloth — Pounds
- 26. Thread, yarn, lap, roving, cord, rope, or wick — Pounds

Other products
- 27. Sheet gasketing (other than beater-add) — Sq. yards
- 28. Packing — Pounds
- 29. Paints and surface coatings — Gallons
- 30. Adhesives and sealants — Gallons
- 31. Asbestos-reinforced plastics — Pounds
- 32. Insulation materials not elsewhere classified (Specify generic name) — (Specify)
- 33. Mixed or repackaged asbestos fiber — Short tons
- 34. Other (Specify generic name) — (Specify)

D. SECONDARY PROCESSOR PRODUCTION

Enter the following information for each type of end product that you shipped from your plant site. Classify end products and asbestos mixtures consumed according to the lists on this form.

End product shipped (Enter one end product per line) (1) Code number	Generic name	Total annual production (2) Year	Quantity	Unit of measure	Asbestos mixture consumed and form (Enter one mixture per line) (3) Code number	Generic name / Form	Function of asbestos in product (4)	Year	Annual consumption of asbestos mixtures (5) Quantity	Unit of measure	Delivered cost (Thousands of dollars)	Confidential Mark (X)
	N/A	1979						1979				
		1980						1980				
		1981						1981				
	☐ Continued	1979						1979				
		1980						1980				
		1981						1981				
	☐ Continued	1979						1979				
		1980						1980				
		1981						1981				

(6) Estimate the percentage of the total value shipped from the plant site reported here as secondary processor production in 1981 — %

Typical terms for products made from asbestos mixtures

Automotive and friction products
- 101. Drum brake lining (light-medium vehicle)
- 102. Disc brake pads (light-medium vehicle)
- 103. Disc brake pads (heavy vehicle)
- 104. Brake block (heavy equipment)
- 105. Clutch facings (all)
- 106. Automatic transmission friction components
- 107. Friction materials (industrial and commercial)
- 108. Custom automotive body filler
- 109. Transmissions
- 110. Mufflers
- 111. Radiator top insulation
- 112. Radiator sealant
- 113. Other (Specify generic name)

Appliances
- 114. Appliance, industrial and consumer (Specify generic name)

Construction products
- 115. Boiler and furnace baffles
- 116. Decorated building panels
- 117. A/C sheet
- 118. Flexible air conductor
- 119. Hoods and vents
- 120. Portable construction building
- 121. Roofing, saturated
- 122. Roof shingles
- 123. Wallboard
- 124. Wall/roofing panels
- 125. Other (Specify generic name)

Clothing
- 126. Aprons
- 127. Boots
- 128. Gloves and mittens
- 129. Hats and helmets
- 130. Overgarters
- 131. Suits
- 132. Other (Specify generic name)

Floor coverings
- 133. Vinyl-asbestos floor tile
- 134. Asbestos-felt-backed sheet vinyl flooring

Electrical products and components
- 135. Cable insulation
- 136. Electronic motor components
- 137. Electrical resistance supports
- 138. Electrical switchboard
- 139. Electrical switch supports
- 140. Electrical wire insulation
- 141. Motor armature
- 142. Other (Specify generic name)

Fire and heat shielding equipment and components
- 143. Arc deflectors
- 144. Fire doors
- 145. Fireproof absorbent paper
- 146. Heat shields
- 147. Molten metal handling equipment
- 148. Oven and stove insulation
- 149. Pipe wrap
- 150. Stove lining, wood and coal
- 151. Stove pipe rings
- 152. Sleeves
- 153. Thermal insulation
- 154. Other (Specify generic name)

Gaskets
- 155. Sheet gasketing, rubber encapsulated beater addition
- 156. Sheet gasketing, rubber encapsulated compressed
- 157. Compressed sheet gasketing (other)
- 158. Metal reinforced gaskets
- 159. Automotive gaskets
- 160. Other (Specify generic name)

Marine equipment and supplies
- 161. Caulks, marine
- 162. Liners, pond or canal
- 163. Marine bulkheads
- 164. Other (Specify generic name)

Paints, coatings, sealants, and compounds
- 165. Asphaltic compounds
- 166. Automotive/truck body coatings
- 167. Buffing and polishing compounds
- 168. Caulking and patching compounds
- 169. Drilling fluid
- 170. Flashing compounds
- 171. Furnace cement
- 172. Glazing compounds
- 173. Plaster and stucco
- 174. Pump, valve, flange, and tank sealing components
- 175. Roof coatings
- 176. Textured paints
- 177. Tile cement
- 178. Other (Specify generic name)

Textile and felt products
- 179. Aluminized cloth
- 180. Rope or braiding
- 181. Yarn, lap, or roving
- 182. Wicks
- 183. Bags
- 184. Belting
- 185. Blankets
- 186. Carpet padding
- 187. Commercial/industrial dryer felts
- 188. Draperies
- 189. Drip cloths
- 190. Fire hoses

Textile and felt products — Con.
- 191. Ironing board pads and insulation
- 192. Mantles, lamp or catalytic heater
- 193. Packing and packing components
- 194. Piano and organ felts
- 195. Rugs
- 196. Tape
- 197. Theater curtains
- 198. Umbrellas
- 199. Other (Specify generic name)

Miscellaneous products
- 200. Aerial distress flares
- 201. Acoustical products
- 202. Ammunition wadding
- 203. Asbestos-reinforced plastic products
- 204. Ash trays
- 205. Baking sheets
- 206. Blackboards
- 207. Candlesticks
- 208. Chemical tanks and vessels
- 209. Filters
- 210. Grommets
- 211. Gun grips
- 212. Jewelry making equipment
- 213. Kilns
- 214. Lamp sockets
- 215. Light bulbs (all types)
- 216. Linings for vaults, safes humidifiers, and filing cabinets
- 217. Phonograph records
- 218. Pottery clay
- 219. Welding rod coatings
- 220. Other (Specify generic name)

E. IMPORTATION OF ASBESTOS MIXTURES

Enter the following information for each type of asbestos mixture that you imported in 1981. Classify your imports according to the lists in section C or D.

Asbestos mixtures (Enter one mixture per line) (1) Code number	Generic name	Asbestos fiber content (if known) (2) Type of asbestos	Quantity (Per unit)	Year	Total annual imports (3) Quantity	Unit of measure	Value of imports (U.S. dollars)	Confidential Mark (X)
	N/A	☐ Chrysotile ☐ Anthophyllite ☐ Unknown		1979				
		☐ Crocidolite ☐ Tremolite		1980				
		☐ Amosite ☐ Actinolite	☐ Unknown	1981				
	☐ Continued	☐ Chrysotile ☐ Anthophyllite ☐ Unknown		1979				
		☐ Crocidolite ☐ Tremolite		1980				
		☐ Amosite ☐ Actinolite	☐ Unknown	1981				
	☐ Continued	☐ Chrysotile ☐ Anthophyllite ☐ Unknown		1979				
		☐ Crocidolite ☐ Tremolite		1980				
		☐ Amosite ☐ Actinolite	☐ Unknown	1981				

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U.S. ENVIRONMENTAL PROTECTION AGENCY

REPORT OF COMMERCIAL AND INDUSTRIAL USES OF ASBESTOS
Continued

COMPANY NAME AND ADDRESS
(Same as reported in item 1 on page 1)

F. IMPORTATION OF ARTICLE(S) CONTAINING ASBESTOS COMPONENTS

Enter the following information for each article that you imported in 1981. Classify your imports according to the lists in section C or D.

Article name (Enter one article per line) (1)		Total annual imports (2)				Asbestos component(s) (Use one line per component) (3)	Confidential Mark (X)
Code number	Generic name	Year	Quantity	Unit of measure	Value (U.S. dollars)		
	N/A	1979					
		1980					
		1981					
		1979					
		1980					
		1981					
		1979					
		1980					
		1981					

G. EMPLOYEES

Record the number of employees at the reporting site in each of the categories below. Count each employee in one category only.

	Number of employees	Confidential Mark (X)
(1) TOTAL number of employees at plant site *(Sum of 2, 3, 4, and 5)* ..... WHOLE PLANT	392	
(2) Number of production employees ..... ASBESTOS PRODUCTION	28	
(3) Number of employees in shipping, receiving, and moving ..... WHOLE PLANT	11	
(4) Number of maintenance employees ..... WHOLE PLANT	22	
(5) Number of other employees	331	

H. SUMMARY OF CURRENT WORKER EXPOSURES

This section requires you to report, by category of production workers, the arithmetic mean of the 8-hour time weighted average (TWA) and ceiling concentration exposure levels for all employees at the reporting site. Report for all employees for whom you have determined a TWA and according to each production line making the reported products. The instructions include a worksheet for making necessary calculations (see Appendix B).

End product (Enter name) (1)		Respondent activity (2)	Production work category (3)	Number of employees (4)	8 hr. time weighted average				Ceiling concentration level (Range) (9)	Confidential Mark (X)
Code number	Generic name				Arithmetic mean of detectable measurements (5)	Standard deviation (6)	Total number of measurements (filters) (7)	Number of non-detectable measurements (8)		
	Not applicable	Miners and millers	**Mine operations** (includes all employees working in mine, including transporters)							
			Mill operations (includes all employees working in production areas of mill)							
34	Acetylene Cylinder	Primary processors	**Fiber introduction operations** (includes blending, mixing, bag opening, fluffing, willowing, etc.)	3	0.17	0.21	5	0	0.01/0.71	X
		Primary processors and secondary processors	**Wet mechanical operations** (includes machining, sawing, drilling, cutting, grinding, pulverizing, weaving, etc.)	7	0.16	0.21	6	0	0.01/0.71	X
			Dry mechanical operations (includes machining, sawing, drilling, cutting, grinding, pulverizing, weaving, etc.)	6	0.02	0.01	5	0	0.01/0.03	X
			Other production employees	12	0.01	0.00	5	0	0.01/0.02	X
		Primary processors	**Fiber introduction operations** (includes blending, mixing, bag opening, fluffing, willowing, etc.)							
		Primary processors and secondary processors	**Wet mechanical operations** (includes machining, sawing, drilling, cutting, grinding, pulverizing, weaving, etc.)							
			Dry mechanical operations (includes machining, sawing, drilling, cutting, grinding, pulverizing, weaving, etc.)							
			Other production employees							
		Primary processors	**Fiber introduction operations** (includes blending, mixing, bag opening, fluffing, willowing, etc.)							
		Primary processors and secondary processors	**Wet mechanical operations** (includes machining, sawing, drilling, cutting, grinding, pulverizing, weaving, etc.)							
			Dry mechanical operations (includes machining, sawing, drilling, cutting, grinding, pulverizing, weaving, etc.)							
			Other production employees							

(10) Sampling and analysis methods

☒ Mark this box if you use the NIOSH method to sample airborne concentrations of asbestos fibers in the workplace and analyze measurements (DHEW (NIOSH) Pub. No. 79-127).

If you utilize other sampling and analysis methods, enter the appropriate codes for those methods listed in the instruction booklet under part I. N/A

(11) Enter the lowest detectable level of the measurements that your company expects to attain by the sampling and analysis methods. (Measurements below this level should be considered as "nondetectable." for the purposes of this rule.) 0.01 Fiber/cc

I. MEASURING ASBESTOS EMISSIONS OR FIBER RELEASE

NPDES Permit number N/A | N/A | Date

☐ Yes, enclosed is a separate report for this section concerning measuring asbestos emissions. ☒ No separate report

EPA Form 7710-36 (6-12-82)

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J. WASTE AND DISPOSAL

Enter the following information for each end product you report in section B(1), C, and D. If you cannot provide information by end product, provide information according to the form of waste (column 2).

End product (1) Code number	End product (1) Generic name	Form of waste (sludge, slurry, broke or scrap, baghouse fines, or specify other) (2)	Total annual quantity of asbestos waste (Short tons) (3)	Average percent asbestos (4)	Disposal site (5) Type of land disposal facility (See instructions) (a)	Disposal site (5) Location (b)	Disposal site (5) Ownership (c)	Disposal site (5) Permitted hazardous waste facility? (d)	Method of disposal (6)	Confidential Mark (x)
34	Acetylene Cylinder ☐ End product report ☒ Form of waste report	Sludge	1330	3 %	☐ Surface impoundment ☐ Waste pile ☐ Land treatment ☒ Land fill ☐ Seepage facility ☐ Injection well	☐ On-site ☒ Off-site	☐ Company ☒ Private ☐ Municipal	☐ Yes ☒ No	Wet Sludge into a Dump Trailer	X
34	Acetylene Cylinder ☐ End product report ☒ Form of waste report	Slurry	781	0.8 %	☐ Surface impoundment ☐ Waste pile ☐ Land treatment ☒ Land fill ☐ Seepage facility ☐ Injection well	☐ On-site ☒ Off-site	☐ Company ☒ Private ☐ Municipal	☐ Yes ☒ No	Wet Slurry pumped into Tank Truck	X
	☐ End product report ☐ Form of waste report			%	☐ Surface impoundment ☐ Waste pile ☐ Land treatment ☐ Land fill ☐ Seepage facility ☐ Injection well	☐ On-site ☐ Off-site	☐ Company ☐ Private ☐ Municipal	☐ Yes ☐ No		

(7) You may describe in a separate enclosure any steps you take to ensure that waste does not release airborne fibers.

☐ Yes, enclosed is a separate description of waste disposal practices. ☐ No separate report

K. POLLUTION CONTROL EQUIPMENT

On separate lines enter information about each piece of air pollution control equipment used to control asbestos emissions at your plant site. ☒ Confidential

Item number (1)	Type of equipment (See code) (2)	Gas stream volume and temperature (3)	Equipment size (Baghouse and ESP only) (4)	Estimated collection efficiency (Percent) (5)	Normal operating schedule (Hrs./year) (6)	Quantity collected annually (Pounds) (7)	Source of emissions (8)	Stack or chimney? (9)	Special problems? (10)
1	(0)	Volume: 520 CFM Temperature: 40-120°F.	Square feet: ☒ N/A	99.5 % ☒ Designed ☐ Actual	Hrs./yr.: 800	Pounds: See Note ☐ Designed ☐ Actual	Plant Dust/Dirt	☒ Yes ☐ No	SEE NOTE (1)
2	(BH) (S)	Volume: 682 CFM Temperature: 70°F.	Square feet: 4.5 ☐ N/A	100 % ☒ Designed ☐ Actual	Hrs./yr.: 250	Pounds: See Note ☐ Designed ☐ Actual	Shredder Room Dust	☐ Yes ☒ No	SEE NOTE (2)
3	(BH) (RA)	Volume: 5-30 CFM Temperature: 70°F.	Square feet: 60 ☐ N/A	100 % ☒ Designed ☐ Actual	Hrs./yr.: 250	Pounds: See Note ☐ Designed ☐ Actual	Mixer	☐ Yes ☒ No	SEE NOTE (3)
		Volume: Temperature:	Square feet: ☐ N/A	% ☐ Designed ☐ Actual	Hrs./yr.:	Pounds: ☐ Designed ☐ Actual		☐ Yes ☐ No	
		Volume: Temperature:	Square feet: ☐ N/A	% ☐ Designed ☐ Actual	Hrs./yr.:	Pounds: ☐ Designed ☐ Actual		☐ Yes ☐ No	
		Volume: Temperature:	Square feet: ☐ N/A	% ☐ Designed ☐ Actual	Hrs./yr.:	Pounds: ☐ Designed ☐ Actual		☐ Yes ☐ No	

(11) Estimate the percent of plant exhaust air that is treated by the equipment listed above: < 0.5 %

Continuation of Item answers CONFIDENTIAL PROCESS INFORMATION

Note 1: The central vacuum system is not to remove airborne particles but to clean up areas which may have asbestos laying on surfaces. It has a primary wet separator that catches 99% of all entering particles. The wet separator empties daily into the waste slurry holding pit. A secondary bag type separator is also employed as an exhaust final filter.

Note 2: Dust filter used only to set up a negative pressure inside the asbestos shredder cabinet to eliminate asbestos fibers from escaping through the loading door to the work area. All the dust collected is returned to the shredder cabinet by manual shakedown. Samples are taken at the discharge end of the exhaust pipe to check for holes in the filters. Exhaust is blown through Dacron 16 oz. filter bags to the outside of the building. Data are estimated, not actual.

Note 3: Dust filter used to prevent pressurization of day mixer during the transfer of asbestos from the shredder to the mixer. The dust is then airblasted back into the mixer by air jets controlled by timers and automatic valves. Eight (8) each Flex-Clean Model 84-CT8, S/N C-4811 16 oz. Dacron, 86" long bags are used. The filtered exhaust to outside is through a 4" pipe. Data are estimated, not actual.

Note 4: (Item 11): The area of the plant where asbestos is handled is an isolated area and 100% of the exhaust air from this area is treated by the above equipment. However, the exhaust air that is treated is a very small amount, less than 0.5%, of the total exhaust air from the entire plant.

[redacted]

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00002

[redacted]

TO (NAME) E.K. Jensen cc J M Cleverdon DATE Oct 27, 1982

LOCATION FROM Bob Anderson

SUBJECT Asbestos LOCATION P2 600

The attached article is for your general information.

BOG

REPLY IN SPACE BELOW.

DUPLICATE

SNAP OUT AND HOLD THIS COPY UNTIL REPLY RECEIVED. FORWARD BALANCE OF SET INTACT WITH CARBONS TO ADDRESSEE.

404716

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Union Carbide trial exhibit UC-840: E. K. Jensen to N. E. Bolton, L. E. Barron and Others Forwarding the Speedway...
ACL Doc 16053 · Page 6 of 11

Reprinted from Connecticut Medicine
September 1982 Issue, Vol. 46, No.9

The Medical Surveillance of Persons Exposed to Asbestos

HILTON C. LEWINSOHN, M.B.

ABSTRACT — This paper will briefly review the techniques which allow persons exposed to asbestos to be kept under surveillance.

The pre-placement evaluation procedure and its usefulness is discussed.

The periodic medical evaluation is described and an outline of the essential requirements is given. The role of radiological surveillance is briefly discussed.

The point is made that both the exposed persons and their management place reliance upon the physician to inform them of adverse findings so that the problem of alternative employment and future protection can be dealt with in a sound and equitable manner.

Medical surveillance should continue for the lifetime of the individual once exposure has been documented and post-retirement or post severance examinations should be provided whenever practicable.

Asbestos-related diseases can be preveneted by good industrial hygiene practices and engineering controls. The physician is able to intervene at the interface between worker and work and hopefully alter the final outcome to the good.

Introduction

Exposure to asbestos in various industries and occupations has been associated with three major lesions involving the intrathoracic organs. Asbestosis, first recognized at the beginning of this century, is a form of interstitial pulmonary fibrosis which has been shown to be related to the dust levels in the workplace and to be dependent upon the duration of such exposure. Lung cancer in heavily exposed workers in industries such as insulation, construction, ship-building and asbestos textiles manufacture, has been adequately documented and related to asbestos exposure. Asbestos exposed persons who smoke cigarettes appear to have a 90 times greater chance of dying from lung cancer than non-smoking non-asbestos exposed persons.[1] The third condition to be associated with exposure to asbestos is diffuse malignant meso-

HILTON C. LEWINSOHN, M.B., Formerly, Director, Occupational Safety and Health Programs, Perkin-Elmer Corp.; Lecturer, Department of Epidemiology, Yale University School of Medicine; Clinical Associate, Department of Laboratory Medicine, University of Connecticut School of Medicine.

Reprint requests to: Health, Safety and Environmental Affairs Dept., Union Carbide Corp., Old Ridgebury Rd., Danbury, CT 06817 (Dr. Lewinsohn).

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ACL Doc 16053 · Page 7 of 11 asbestosclaims.law/library/16053/7

thelioma of the pleura (or peritoneum).[2] Unlike asbestosis and lung cancer, this rare tumor has been more difficult to characterize in terms of dose-response and pathologic features.

Less clear-cut associations have been described by some observers between asbestos exposure and cancers involving the gastrointestinal tract[3,4] and cancers in other organs such as the larynx[5] or renal organs.[6] Cancer of the ovary in women has been ascribed to asbestos exposure.[7] It is suggested that the cases described were actually of peritoneal origin and due to malignant mesothelioma of the peritoneum. It may be difficult to distinguish ovarian carcinoma from peritoneal mesothelioma.

Because of its increasing and widespread use in the U.S.A. in many industries during the past 50 years, lasting up until very recent times, it has been estimated that millions of people have been exposed in various ways to various varieties of asbestos.[8]

The asbestos-related diseases are not readily amenable to therapy. Asbestosis is slowly progressive, the outlook for the person with lung cancer is very poor and diffuse malignant mesothelioma of the pleura or peritoneum is invariably fatal within a short period of time after diagnosis. The physician practicing in the industrial environment is faced with a dilemma of severe proportions when attempting to intervene or prevent undue suffering on the part of exposed individuals, but with diligence and perserverence can definitely exert a meaningful influence.

Physicians whose practice includes providing a service to industry must be actively involved with workers and management, must be completely familiar with the properties of asbestos in use, must understand the manufacturing processes in the plant and have a clear concept of the plant design and layout. The doctor who has taken the trouble to become educated in this way will be better equipped to manage the health of people at work. In addition to gaining practical experience of the workplace, the physician also needs to gain a thorough working knowledge of the etiology, pathogenesis, epidemiology and therapy of work-related diseases. The physician should acquire a working knowledge and appreciation of the theory and practice of industrial hygiene, including an understanding of sampling and monitoring procedures.

The role of the physician is to insure that industry employs people who are suited to the tasks required of them and that they do not suffer injury or illness as a result of the work they are called upon to do.

Pre-Placement Medical Evaluation of Persons Exposed to Asbestos

The pre-placement medical evaluation is designed to determine the suitability of the employee for the job and the suitability of the particular job for the individual concerned. When asbestos exposure is likely the workplace conditions must be known before decisions can be made about a prospective employee with medical contraindications to such employment. As the result of experience already gained in the development of medical surveillance programs, the suitability of prospective employees for the specific tasks in question may be estimated and based upon defined selection criteria.[10] Applicants should be appropriately counseled regarding their fitness or otherwise for employment in an asbestos-exposed occupation and if any restrictions need to be imposed on medical grounds they should be indicated to the applicant and the employer prior to placement in the job. There are certain broadly defined conditions which should contraindicate employment: a history of previous work in another industry with a recognized dust hazard such as coal mining or stone quarrying, an existing pulmonary disability due to pneumoconiosis or from any other source, the presence of obstructive airways disease with or without emphysema, asthma, and organic heart disease. Other contraindications to employment in a dusty job which have been recommended are: (1) Nasal obstruction or deformity of such a degree as to make the wearing of a dust mask difficult or impossible, (2) gross physical deformity of the chest such as scoliosis or kyphosis, or as a result of thoracic surgery, (3) chronic bronchitis, bronchiectasis or emphysema, (4) gross hypertension with cardiac impairment and (5) the presence of rheumatoid arthritis.

Apart from identifying people who should not be employed in dusty work, the pre-placement evaluation serves the purpose of establishing base-line data for longitudinal prospective follow-up. The data which should be incorporated in the medical records for this purpose are summarized in Tables 1 and 2 and conform with the requirements of the Occupational Health & Safety Administration's "Asbestos Standard."

Table 1

Identification characteristics required to establish a data base for long term follow-up of asbestos workers.

A. 1. Name (include maiden name for married women)
   2. Identification number (social security number, etc.)
   3. Date of Birth
   4. Place of Birth
   5. Address

B. 1. Name of spouse
   2. Identification number of spouse (social security number, etc.)
   3. Spouse's date of birth

C. 1. Names, dates of birth, addresses and identification number of children

D. 1. Employee's company I.D. number (clock no., etc.)*
   2. Employee's occupation (job description, including raw materials handled)
   3. Latest dust levels in job and department

*The employee I.D. number should never change and should be reallocated to the same employee upon rehiring after termination of employment.

The physician should take the opportunity which the pre-placement evaluation affords to counsel and advise the job applicant regarding the known facts about asbestos-related diseases. It is essential to emphasize the special risks the person will run if he or she smokes cigarettes and every effort should be made to discourage the habit.

A04718

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ACL Doc 16053 · Page 8 of 11 asbestosclaims.law/library/16053/8

Table 2

Minimum requirements to be recorded to establish a data base for long term follow-up of asbestos workers.

Complete, detailed, occupational history since leaving school
Family history
Smoking history
Social history (drugs, alcohol, etc.)
Previous illnesses of note, especially respiratory ailments
Detailed respiratory symptoms history (MRC or ATS Respiratory Symptoms Questionnaire)
Vital and physical signs
Special investigations: 17" x 14" Postero-anter chest roentgenogram*
Measurement of lung function (ventilatory capacity, lung volumes, gas transfer, etc.)
Sputum cytology (value not proven in screening)
Measurement of angle between nail and cuticle to document appearance of clubbing of fingers.

*Oblique views, and occassionally lateral views, may be required to clarify pleural abnormalities.

It has previously been pointed out that the pre-placement medical evaluation "is an essential tool for use in the medical supervision of asbestos workers because it establishes the principles upon which future management will be based. It gives the prospective applicant an insight into the seriousness of the problem and enables the physician to recommend suitability, limited suitability or total unsuitability of the individual for the job. The opportunity which the pre-placement physical examination provides for the medical staff to counsel the individual and establish rapport is unique and should not be missed. This period in the career of the job applicant provides the best opportunity for the recording of identification details and verifying them, in order to establish the data base for long-term follow-up."[12]

Periodic Medical Evaluation

Persons exposed to asbestos in their occupation should be kept under medical surveillance. The object of periodic examinations is not only to determine changes in the physical condition, physiological status or radiological appearances of the exposed person but also to re-evaluate the workplace conditions and the individual's suitability to continue doing the same job. Medical findings can be recorded on an ongoing basis to allow comparison from one examination to the next. The periodicity of the evaluation process will depend upon demonstrated need and available man-power as well as regulatory requirements. The Occupational Safety and Health Administration promulgated the Asbestos Standard (CFR 1910.1001) in July 1972.[11] Section 1001(j)(3) requires that every employer shall provide, or make available, at least annually, comprehensive medical examinations to each employee engaged in an occupation exposed to airborne concentrations of asbestos fibers. The minimum requirement is for "a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$)."

Periodic medical evaluation is designed to detect the biological effects of inhalation of asbestos as early as possible and hopefully at a stage when removal from further occupational exposure to asbestos may arrest or significantly delay the progress of asbestosis or the occurrence of other asbestos-related conditions. Epidemiologic evidence of the value of this procedure is not yet available and the changing environmental conditions in the workplace throughout the asbestos industry over the past fifty years only serves to confuse the issue when attempting to assess the value of early diagnosis.[13]

The periodic evaluation should include a physical examination even though the OSHA standard does not specify it. The examiner should concentrate on the physical signs associated with pulmonary fibrosis such as bilateral end-inspiratory fine crackles at the lung bases, finger-clubbing and breathlessness. In the case of long-service employees, especially heavy-smokers, the possibility of lung cancer should always be borne in mind. Transient pleural effusions occur in asbestos workers.

The aim of radiologic surveillance of asbestos workers is to compare serial roentgenograms taken throughout the exposure period at regular intervals in order to detect the earliest changes which would result in deciding whether the individual should be advised to consider alternative employment. Radiographic evidence of predominantly basal diffuse interstitial fibrosis is the characteristic change seen. The Medical Advisory Panel (MAP) of the Asbestos International Association has prepared a document entitled "Criteria for the Diagnosis of Asbestosis and Considerations in the Attribution of Lung Cancer and Mesothelioma to Asbestos Exposure" which will become available in early 1982.[14] The MAP recommend that to ensure comparability of radiographs they must be of good technical quality, of full size (14" x 17") and both costophrenic angles should be visible. Ideally inspiration should be such as to have brought the diaphragm below the fifth rib anteriorly and the tenth rib posteriorly. The recording of changes on the radiograph should be in accordance with the ILO International Classification of Radiographs of Pneumoconioses (1980).[15]

Pleural lesions are often the first radiological indicator of exposure to asbestos. These changes may consist of diffuse or localized pleural thickening or circumscribed pleural plaques, with or without calcification, may occur and need not be associated with obvious parenchymal fibrosis. The pleural abnormalities can be sufficiently extensive to obscure the lung fields and may, in rare cases, lead to impairment of lung function.

It has been shown that whereas parenchymal radiographic patterns change in relationship to dust concentrations experienced over the course of time, pleural changes are related to length of exposure, irrespective of dose. Pleural changes probably represent an important radiologic sign which is part of a constellation of changes observed in low-grade exposure groups where parenchymal effects are less likely to be seen.[16]

A04719

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ACL Doc 16053 · Page 9 of 11 asbestosclaims.law/library/16053/9

Weill[17] has attempted to evaluate the basis for clinical decision making by the physician evaluating patients who have had occupational exposure to asbestos. In an asbestos worker, definite radiographic evidence of diffuse pulmonary fibrosis, even if it is minimal in profusion or extent, should be an indication to advise the individual that further exposure to asbestos dust may increase the probability that the condition will progress with time. The greater the past cumulative dust exposure, the higher the probability of progressive pulmonary fibrosis according to Weill. Cessation of exposure is only likely to minimize the degree of progression of fibrosis and, because the excess risk for development of respiratory cancer has been shown to be dose-related, this should also be minimized by not adding further to the dust dose of individuals with radiographic signs of asbestosis.

Pleural thickening and pleural plaques are apparently related to length of exposure and time since first exposure but not to dose, and are not therefore likely to be influenced by modest additional exposure. Weill believes that when only pleural stigmata of asbestos exposure are present, continued medical surveillance and periodic evaluation is indicated but job transfer is not necessary. The patient should be told about the pleural lesions which have been noted so that the subsequent election to change to a job without further asbestos exposure can be considered if so desired.

In the past 5 or 6 years the use of computed tomography (CT) in the diagnosis of asbestos effects on lungs and pleura has shown that both types of lesion are seen more obviously than on conventional radiographs. This diagnostic technique is not yet a practical tool to add to the medical surveillance armamentarium but it is useful in early diagnosis. Early pleural plaques can be reliably diagnosed and are not confused with "companion" shadows adjacent to the ribs as in chest radiographs. Fine interstitial parenchymal disease can also be detected on CT when not visible on the chest radiograph according to Kreel.[18] By the time the changes of asbestosis have become visible on the chest radiograph, the changes on CT scan appear gross. The same author states that in one third of cases with unilateral pleural effusion there will be evidence on CT of pleural plaques particularly in the contralateral hemithorax. CT scans may thus be very useful in the diagnosis of mesothelioma and Kreel postulates that the finding of pleural effusion, rib destruction, pleural plaques or calcifications, intrapulmonary nodules and thickening of pleura, pleural fissures and paramediastinal structures especially at the bases and posteriorly should suggest this lesion. He also feels that the delineation of tumor nodules within effusions allows this tumor to be analyzed sequentially and better evaluated following treatment thus leading to improved therapeutic modalities.

In the periodic evaluation of asbestos exposed persons it is recommended that tests of lung function be used to determine the earliest defects possibly resulting from exposure. The measurement of the timed vital capacity components, namely, forced vital capacity (FVC), forced expiratory volume in the first second of expiration ($FEV_{1.0}$) and the ratio of these ($FEV_{1.0}$/FVC), should be routinely recorded. A restrictive pattern is consistent with the development of pulmonary fibrosis (asbestosis) but other causes should first be ruled out. A predominantly obstructive pattern is uncommon in the absence of a smoking history. A comparison of periodic lung function test results over a number of years is of much greater value in the follow-up of an individual than a single observation where comparisons can only be made to the "predicted normal value." Where facilities exist for more complete studies they should at least include measurement of lung volumes and the single-breath carbon monoxide diffusing capacity.

No mention has been made thus far of the role of sputum examination for exfoliative cytology. A proposal has been made in the United States that this should be performed routinely on persons with 10 or more years of exposure to airborne concentrations of asbestos fibers or who are 45 years of age or older.[19] A large-scale multi-institutional program designed to evaluate periodic screening for early stage bronchogenic carcinoma among asymptomatic asbestos workers is currently in progress.[20] Interim results do not indicate that sputum cytology is of overall benefit to screened individuals and "early data from studies of smoking men at high risk of lung cancer indicate that only one fourth of asymptomatic lung cancers are detected by sputum cytology and the remainder are detected by chest radiography."[21]

The value of the periodic medical evaluation depends upon the manner and thoroughness with which it is performed. The standardization of the protocol will enchance its early diagnostic capabilities. The strictest attention must be paid to the detail of radiologic and physiologic methods employed. It should always be borne in mind that the employee's attitude to periodic evaluation differs from that to the pre-placement evaluation and whereas the concerns at the time of the latter were job suitability, the concerns in the employee's mind at the time of the former are job retention.

Life-Long Surveillance

Persons who are exposed to asbestos should not only be kept under surveillance while exposed, but because of the lapsed interval between first exposure and the detection of biological effects, observation should continue at periodic intervals for the rest of their lives.

Retirees who receive pensions from employers should be easier to follow-up than persons who sever employment prior to reaching retirement age. Employers should endeavor to impress upon such employees the value of remaining under medical surveillance. The follow-up of retirees could be undertaken by means of a health questionnaire sent by mail and incorporating a reminder to each one to see a physician and have a chest radiograph

AU4720

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ACL Doc 16053 · Page 10 of 11 asbestosclaims.law/library/16053/10

taken. In some cases this could lead to the early detection of lung cancer and therapy which could prolong life and alleviate suffering.

Comments

The prevention of asbestos-related diseases depends upon engineering technology and dust control. The role of the physician is the prevention of ill-suited job-placement and intervention at the interface between worker and work. The technique of medical surveillance is merely one cog in the wheel which comprises the total effort required to safeguard employee health. The active collaboration of employer and employee in the surveillance program allows it to achieve significant results of benefit to both.

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ACL Doc 16053 · Page 11 of 11 asbestosclaims.law/library/16053/11