SUPPLEMENTAL INFORMATION

FOR

TESTIMONY CONCERNING

POSSIBLE CHANGES IN THE

HEALTH AND SAFETY CODE SECTION 25910

AS PERMITTED BY SB-1591

Asbestos Fiber Exposure During The Destruction of Maintenance Coatings By Sandblasting

Prepared for the Occupational Safety
and Health Standards Board
Sacramento, California
November 15, 1978

Prepared By
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PLAINTIFF'S EXHIBIT
tabbies
UC-1537

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SUMMARY AND CONCLUSIONS

The air monitoring test during sandblasting at Corona, California that was reported in the October 30, 1978 DOSHA letter to the Standards Board was a cooperative study wherein Union Carbide Corporation and DOSHA collected simultaneous paired samples on the workers. A report of the Union Carbide results is provided herein. The UCC counts ranged from about the same to about one-half of those found by DOSHA. Considering the nature of the samples, both laboratories were in accord that the differences were due to the normal random errors in the sample collection and counting procedure and did not represent a significant difference between the laboratories.

The critical problem with these samples was the presence of large amounts of mineral particulate that met the criteria for a countable fiber, but in all probability were only very rarely asbestos. An examination of three of the filters by scanning electron microscopy was carried out by Union Carbide. This study confirmed that free asbestos was rare and made up very roughly one countable fiber out of fourteen.

This information led to a further cooperative, large-scale sandblasting test at Trona, California wherein the samples were collected by DOSHA and counted by the Federal OSHA Compliance Laboratory in Salt Lake City. The Federal laboratory has considerable experience with this type of difficult sample and uses a combination of sophisticated optical techniques and electron microsopy to aid in the identification of non-asbestos particulate. The results of this study showed a ceiling concentration of 1.6 fiber/cc >5μ and 8-hour TWAs in the 0.1 to 0.4 fiber/cc >5μ range.

We believe that these levels, which may still be conservative (high), are more representative of asbestos fiber release from maintenance coatings during sandblasting than the data that either participating laboratory obtained at the earlier test at Corona.

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A. BACKGROUND

During the hearings on the 1976 Presley Bill, Assemblyman Fenton asked the Department of Health to collect additional exposure data during the use of the products for which temporary exemptions were eventually granted. A cooperative government-industry effort ensued. The data obtained were submitted to the Standards Board by Mr. James H. Heacock of DOSHA in a letter dated October 30, 1978 (Attachment I). Appendix A of this letter covered tests of portland cement plaster. Appendices B and C related to sandblasting of maintenance coatings. This discussion is limited to maintenance coatings, the plaster applications will not be covered.

The initial two sandblasting tests (Location 1 and Location 2, Appendix B in the DOSHA letter) involved the removal of an asbestos-containing coating from a plaster or a stucco wall. When the results became available, they were higher than anticipated, i.e. 0.5-3 fibers per cc longer than 5μ. The manufacturer of the paints then asked Union Carbide to participate in a third test jointly with the DOH. This was acceptable to the DOH and the Village Grove Park location in Corona was selected as the site.

In this test the blasting operator, helper, and observer each wore two pumps and simultaneous samples were collected in the breathing zone with filter cassettes positioned on opposite shoulders. Paired background and area samples were also collected. A detailed report of the Union Carbide results is provided in Attachment II. For easy reference the corresponding DOSHA report has also been included in Attachment I as Appendix B. Only the key points of these reports will be summarized here.

B. RESULTS AND DISCUSSION

1. Fiber Counts by the Optical Phase - Contrast Method

The samples collected in the test at Village Grove Park, Corona were extremely difficult to count. They were heavily loaded with both fibrous and non-fibrous dust. Considerable particulates were present that met the dimensional criteria of a fiber, i.e. length greater than 5μ, length to diameter ratio greater than three, but they were clearly not asbestos. Both counters were experienced and discussed the problem of evaluating filters of this type prior to counting.

In an attempt to assess the impact of the asbestos fiber recognition problem, Union Carbide divided the fibers counted into two classes, "obvious chrysotile asbestos" and "possible asbestos fiber." When there was any doubt about a fiber's identity it was included in the count. The total of both classes would be the value ordinarily reported as asbestos.

Particles which were obviously not asbestos were not counted. This included such things as unbroken fiberglass, mineral flakes with non-parallel sides, and particulate that appeared bright under phase contrast. It should be noted that the only known source of asbestos of any type was the 5% by weight chrysotile that was added by the manufacturer. (Note that the 2% asbestos figure reported by DOSHA in Appendix B is in error.)

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The Union Carbide results ranged from 0 to 0.8 fibers/cc >5μ of "obvious chrysotile" and from 0 to 3.6 fiber/cc >5μ for total asbestos. (See Attachment II.) These total values are compared with the DOSHA results for each paired sample collected on the opposite shoulder of the workers in Table 1. These values range from 0.1 to 7.1 fiber/cc >5μ.

Examination of Table I shows that the pretest controls and several of the samples collected on the observer and on the helper resulted in the detection of only several fibers in the hundred fields examined under the microscope. Blank filters, i.e. those which have never been exposed, will read from zero to several fibers per 100 fields, so these results really are not distinguishable from background. The remaining eight pairs ranged from about the same to a Cal/OSHA counting of about double that of UCC, 7.1 vs 3.2. Considering that these counts are not from the same filter but from filters that were collected on opposite shoulders, both laboratories were in agreement that the differences were probably the result of random errors in the sampling and counting method and did not represent a significant difference between the laboratories.

The time-weighted averages for the two operators for the time period where sandblasting was actively in progress and for the entire eight-hour day were calculated for each set of total asbestos count data and are listed below. The two workers' actual TWA exposures for the particular day were all below 0.5 fiber/cc >5μ. The highest value reported by either laboratory, 7.1 fiber/cc >5μ is still below the ceiling limit of 10 fiber/cc >5μ.

Time-Weighted Average Exposures
(Fibers/cc >5μ)

	During Active Operations		8-Hour Day Basis	
	Cal/OSHA	UCC	Cal/OSHA	UCC
Helper	1.1	0.6	0.2	0.1
Operator	4.1	2.2	0.2	0.2

2. Fiber Analysis by Scanning Electron Microscopy

It was evident from the results that non-asbestos material was being included as asbestos in the counts reported. In order to check this further, Union Carbide examined three of the filters with a scanning electron microscope.

A small square from each of three filters was exposed to acetone vapor under conditions that had previously been determined to collapse the filter to a smooth surface but did not allow the particles to sink into the filter. Shrinkage in area was measured and found to be about 45%. The samples were then gold-coated and mounted for microscopic examination in the normal manner.

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TABLE I

COMPARISON OF AIRBORNE ASBESTOS FIBER COUNTS DURING SANDBLASTING OF ASBESTOS CONTAINING MAINTENANCE COATING

Description of Operation	Sample Data				Fiber Counts						
		Time			UCC		Cal/OSHA	UCC SEM (f/cc)			
	No.	On	Off	Total Min.	100 fields	f/cc	f/cc	Asbestos	Non-Asbestos	Total	Comments
Pretest Controls											
On fence, left side of area to be sand-blasted. ~4 1/2' above ground.	G-16	10:35	10:56	21	2	0.1	0.3				
On fence, ~100' from G-16. ~5' above ground.	F-44	10:42	10:59	17	0	0	0.1				
Personal sample on observer ~25' from fence and moving parallel to fence.	A-86	10:39	10:52	13	2	0.1	0.2				
Observer (During Sand-Blasting)											
Personal sample on observer ~20-30' from fence and moving parallel to fence.	A-81	11:12 11:25	11:18 11:27	6 2 8	1	0.1	0.1				
Same as A-81.	J-89	12:26	12:52	26	1	0.03	0.2				
Area sample on fence. 5' above ground and ~40' downwind. (In lieu of observer)	G-3	1:35	2:00	25	29	0.7	1.9	0.3	1.0	1.3	3 Asbestos fibers in 25 fields
Helper (During Sand-Blasting)											
Personal sample. Assisting with hoses. Operating sand feeding equipment.	G-48	11:10 11:24	11:18 11:26	8 2 10	15	1.0	1.4				
Same as G-48.	X-8	12:25	12:48	23	28) 45)	1.1	2.2				
Same as G-48.	C-15	1:08	1:22	14	3	0.2	0.5				
Same as G-48.	X-4	1:36	1:58	22	2	0.06	0.2				
Blasting Operator (During Sand-Blasting)											
Personal sample. Operator handling sand-blasting nozzle, standing ~2' from fence.	D-71	11:10 11:24	11:18 11:26	8 2	32	2.2	1.6	0.3	1.5	1.8	3 asbestos fibers in 25 fields
Same as D-71.	X-14	12:25	12:36	11	43) 58)	3.2	7.1				
Same as D-71.	G-34	12:38	12:46	8	38	3.3	6.6				
Same as D-71 except inside of hood.	X-2	1:08	1:22	14	34	1.7	3.7				
Same as D-71.	X-3	1:36	1:58	22	56	1.8	2.1	0.0	1.0	1.0	0 asbestos fiber in 75 fields

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Random fields were then selected and examined for particulate matter which met the "fiber" criteria, i.e. L >5μ, L/D >3. Magnification was 1500X and the defined field area used was 0.0048mm^2, This is similar to the optical counts where the field was 0.0062mm^2. Whenever a fiber was found it was analyzed by Edex in the spot mode for chemical composition.

Detailed results are listed in Table II and Figures 1 through 10, and are summarized below.

Sample No.	Total Fields Counted	Fibers Found(1)		
		Chrysotile	Non-Asbestos	Total
X-3	75	0	34	34
G-3	25	3	11	14
D-71	25	2(2)	19	20
	125	5	64	69

(1) Length greater than 5μ, length/diamer greater than 3.

(2) Does not include a non-fibrous asbestos "clump".

These data demonstrate that free asbestos fiber in the generated dust is both rare and a small fraction of the total fibrous particulates, in this case about one fiber in fourteen. The potential for erroneously high counts by the ordinary phase-contrast optical method is obvious.

The number of fields examined for each filter and number of fibers found were too small for a reliable estimate of airborne concentration. As a point of interest, however, the fibers per cc values corresponding to the numbers of fibers found have been shown in Table 1 and positively identified chrysotile asbestos ranged from 0 to 0.4 fiber/cc >5μ. These would be ceiling, not TWA values.

C. COMMERCIAL SANDBLASTING TEST

When these results became avilable, the problem was discussed with Mr. Heacock of the DOH and it was agreed that a carefully-planned, large-scale test using professional operators and equipment should be made. Samples would be collected by DOSHA and counted by the Federal OSHA Compliance Laboratory in Salt Lake City. This laboratory has had considerable experience with the type of highly contaminated samples expected and utilizes a combination of sophisticated optical techniques and electron microsocpy to provide more reliable counts.

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TABLE II

SAMPLE ANALYSIS BY SCANNING ELECTRON MICROSCOPE

1500X — Chemical Composition by EDEX — Field Area 0.0048mm^2

SAMPLE NO. E-3

Field No.	No. of Fibers	Approx. Length (μ)	Na	Mg	Al	Si	K	Ca	Cu	Fe	Zn	Ti	Identification
1	0												
2	0												
3	0												
4	0												
5	0												
6	0												
7	0												
8	0												
9	0												
10	0												
11	1	5	-	X	X	X	X	X	-	X	-	-	Non-Asbestos (Photos 1 & 1a)
12	0												
13	1	5	-	-	X	X	X	X	-	X	-	-	Non-Asbestos
14	0												
15	0												
16	0												
17	1	7.5	X	-	X	X	X	-	X	X	-	-	Non-Asbestos (Photos 2 & 2a)
18	2	24	-	-	-	X	-	-	-	-	-	-	Both Non-Asbestos
		5	-	-	X	X	X	-	-	-	-	-	
19	2	10	-	-	-	X	-	X	-	-	-	-	Both Non-Asbestos
		8	-	-	X	X	X	-	-	-	-	-	(Photos 3 & 3a)
20	2	6	-	-	-	X	-	-	-	-	-	-	Both Non-Asbestos
		15	-	-	X	X	X	-	-	-	-	-	
21	3	12	-	-	X	X	X	-	-	-	-	-	
		5	-	-	X	X	X	-	-	-	-	-	All Non-Asbestos
		10	-	-	X	X	X	-	-	-	-	-	
22	0												
23	1	12	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
24	0												
25	1	5	-	-	-	X	-	-	-	-	-	-	Non-Asbestos

14 Fibers — 0 Asbestos, 14 Non-Asbestos

SAMPLE NO. E-3 (1)

Field No.	No. of Fibers	Approx. Length (μ)	Na	Mg	Al	Si	K	Ca	Cu	Fe	Zn	Ti	Identification
1	1	8	-	-	-	-	-	-	-	-	X	-	Non-Asbestos
2	1	5	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
3	1	9	-	-	X	X	X	-	-	-	-	-	Non-Asbestos
4	0												
5	1	6	-	-	-	-	-	-	-	-	X	-	Non-Asbestos
6	0												
7	0												
8	0												
9	1	18	-	-	X	X	X	X	-	-	-	X	Non-Asbestos
10	2	7	-	-	-	X	-	-	-	-	-	-	
		7	-	-	-	X	-	-	-	-	-	-	Both Non-Asbestos
11	1	6	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
12	0												
13	0												
14	0												
15	0												
16	0												
17	0												
18	1	6	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
19	1	25	-	-	-	X	X	-	-	-	-	-	Non-Asbestos
20	0												
21	1	18	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
22	0												
23	0												
24	0												
25	0												
26	0												
27	0												
28	0												
29	0												
30	0												
31	1	6	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
32	0												
33	1	11	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
34	0												
35	0												
36	0												
37	1	15	-	-	X	X	X	-	-	-	-	-	Non-Asbestos
38	0												
39	0												
40	3	15	-	-	-	X	-	-	-	-	-	-	
		14	-	-	-	X	-	-	-	-	-	-	All Non-Asbestos
41	0												
42	0												
43	0												
44	0												
45	0												
46	2	14	-	-	-	X	-	-	-	-	-	-	
		14	-	-	-	X	-	-	-	-	-	-	Both Non-Asbestos
47	0												
48	0												
49	1	15	-	-	-	X	-	-	-	-	-	-	Non-Asbestos
50													

20 Fibers — 0 Asbestos, 20 Non-Asbestos

(1) Successive adjacent fields counted.

SAMPLE NO. G-3

Field No.	No. of Fibers	Approx. Length (μ)	Na	Mg	Al	Si	K	Ca	Cu	Fe	Zn	Ti	Identification
1	1	27	-	X	-	X	-	-	-	-	-	-	Asbestos (Photos 14 & 14a)
2	3	15	-	-	-	X	-	-	-	-	-	-	
		5	-	-	-	X	-	-	-	-	-	-	All Non-Asbestos
		8	-	-	-	X	-	-	-	-	-	-	
3	0												
4	0												
5	2	10	-	-	X	X	X	-	-	-	-	-	
		10	-	-	X	X	X	-	-	-	-	-	Both Non-Asbestos
6	0												
7	2	10	-	X	-	X	-	-	-	-	-	-	Asbestos
		5	-	-	-	-	-	-	-	-	X	-	Non-Asbestos
8	0												
9	0												
10	0												
11	0												
12	0												
13	0												
14	0												
15	0												
16	1	5	-	-	X	X	X	-	-	-	-	-	Non-Asbestos
17	0												
18	1	8	-	X	-	X	X	-	-	-	-	-	Asbestos
19	0												
20	1	7	-	-	X	X	X	-	-	-	-	-	Non-Asbestos
21	0												
22	3	7	-	-	X	X	X	-	-	-	-	-	
		8	-	-	-	X	-	-	-	-	-	-	
		8	-	-	-	X	-	-	-	-	X	-	All Non-Asbestos
23	0												
24	0												
25													

14 Fibers — 3 Asbestos, 11 Non-Asbestos

SAMPLE NO. G-71

Field No.	No. of Fibers	Approx. Length (μ)	Na	Mg	Al	Si	K	Ca	Cu	Fe	Zn	Ti	Identification
1	1	8	-	-	X	X	X	-	-	X	-	-	Non-Asbestos
2	2	14	-	-	-	X	-	-	-	-	-	-	
		21	-	-	X	X	X	-	-	-	-	-	Both Non-Asbestos
3	2	10	-	-	X	X	-	X	-	-	-	-	
		12	-	-	X	X	X	-	-	-	-	-	Both Non-Asbestos
4	0												
5	0												
6	0												
7	4	14	-	-	-	X	-	-	-	-	-	-	
		14	-	-	X	X	X	-	-	-	-	-	
		18	-	-	X	X	X	-	-	-	-	-	All Non-Asbestos
		20	-	-	-	-	-	X	-	-	-	-	
8	1	30	-	X	-	X	-	X	X	-	-	X	Asbestos (Photos 5 & 5a)
9	1	7	0	X	X	X	-	-	-	X	-	-	Asbestos (Photos 6 &6a)
10	0												
11	0												
12	1	5	-	-	X	X	X	-	-	-	-	-	Non-Asbestos
13	2	6	-	X	X	X	X	-	-	-	-	-	Asbestos (Photos 7 and 7a)
		8	No reading obtained (burnout).										Not Counted as Asbestos
14	0												
15	0												
16	0												
17	0												
18	1	15	No reading obtained (burnout).										Not Counted as Asbestos
19	1	7	-	-	X	X	X	-	-	-	-	-	Non-Asbestos
20	1	6	-	-	-	-	-	-	-	X	-	-	Non-Asbestos
21	2	14	-	-	X	-	X	-	-	X	-	-	Asbestos Clump (Photos 10)
		8	-	-	X	X	X	-	-	X	-	-	Non-Asbestos (Photos 11 &
22	1	5	-	-	-	-	X	-	-	-	-	-	Non-Asbestos (Photos 12 &
23	0												
24	0												
25	1	15	-	-	-	-	X	-	-	-	-	-	Non-Asbestos

20 Fibers, 1 "Clump" — 3 Asbestos Fibers, 1 Asbestos Clump, 17 Non-Asbestos

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The protocol for this study is appended as Attachment III and the DOSHA Report (Appendix C of their October 30, 1978 submission to the Board) of the study is also given for reference. The DOSHA report covers the test very well although it should be noted that the Federal OSHA counter included any fiber of doubtful identity as asbestos so the results presented would be conservative (high). It is also appropriate to acknowlege that the test site was provided through the courtesy of Kerr-McGee Company at Trona, California. Figures 11 and 12 show photographs of the test which give a clear illustration of the nature and scope of the operation.

D. CONCLUSIONS

The fiber counts reported in Appendix B of the DOSHA letter of October 30, 1978 as well as the Union Carbide counts of the simultaneous counts include a great deal of material that is not asbestos. The subsequent large-scale test although possibly still conservative (high), is more representative of exposure during sandblasting.

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E. FIGURES 1 - 12

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Photo 1 - Sample X-3 @ 10,000X

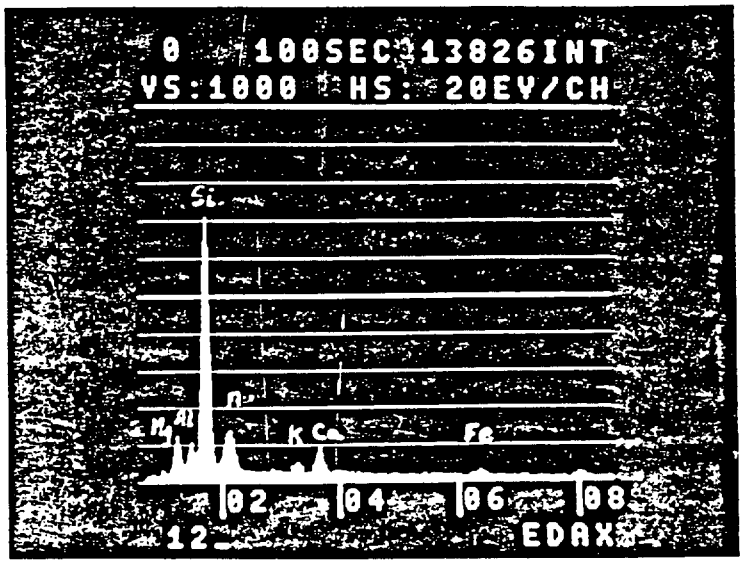


Photo 1A - Spot Mode of Particle Show Above

FIGURE 1

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Photo 2 - Sample X-3 @ 1500X

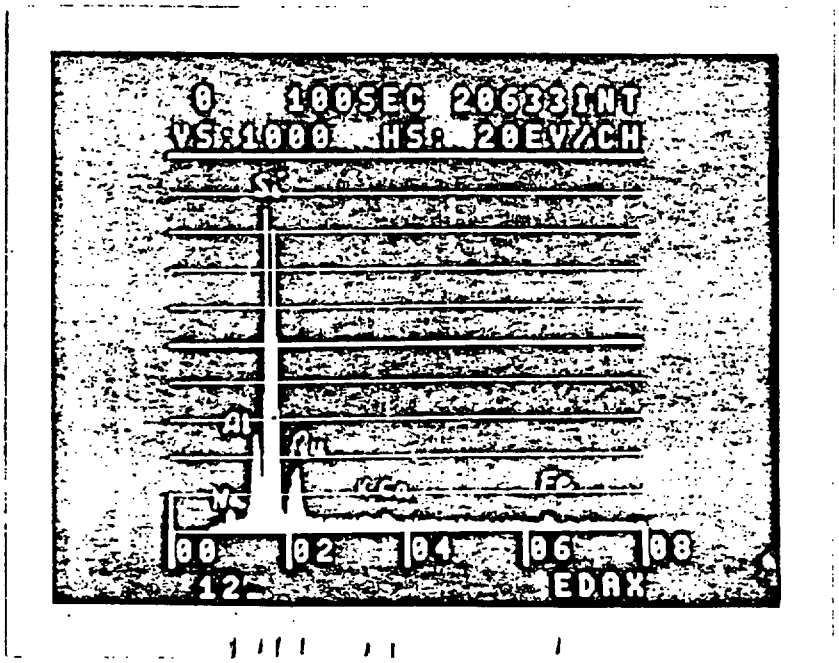


Photo 2A - Spot Mode of Particle Circled Above

A 1003

FIGURE 2

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Photo 3 - Sample X-3 @ 1500X

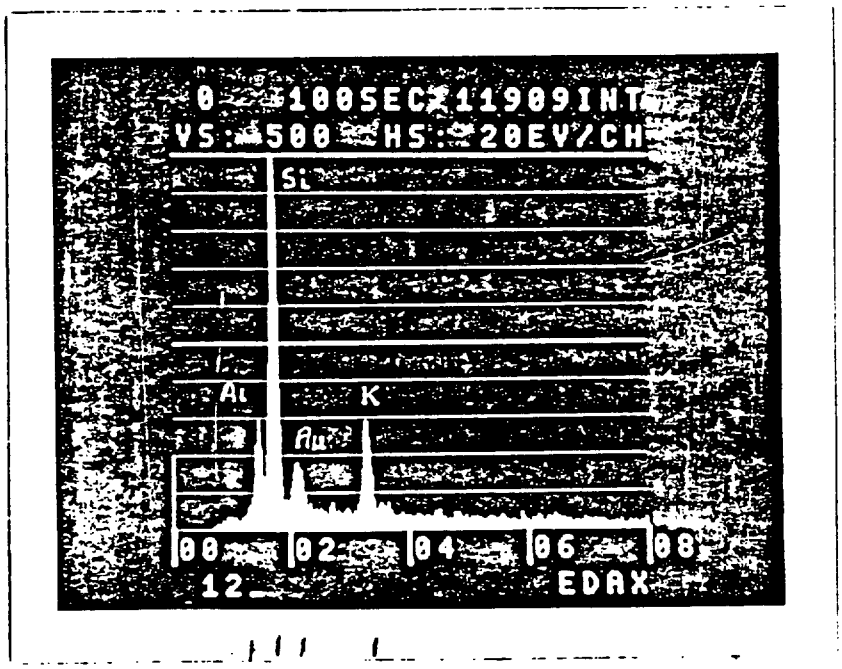


Photo 3A - Spot Mode of Particle Shown Above

FIGURE 3

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Photo 6 - Sample D-71 @ 1500X

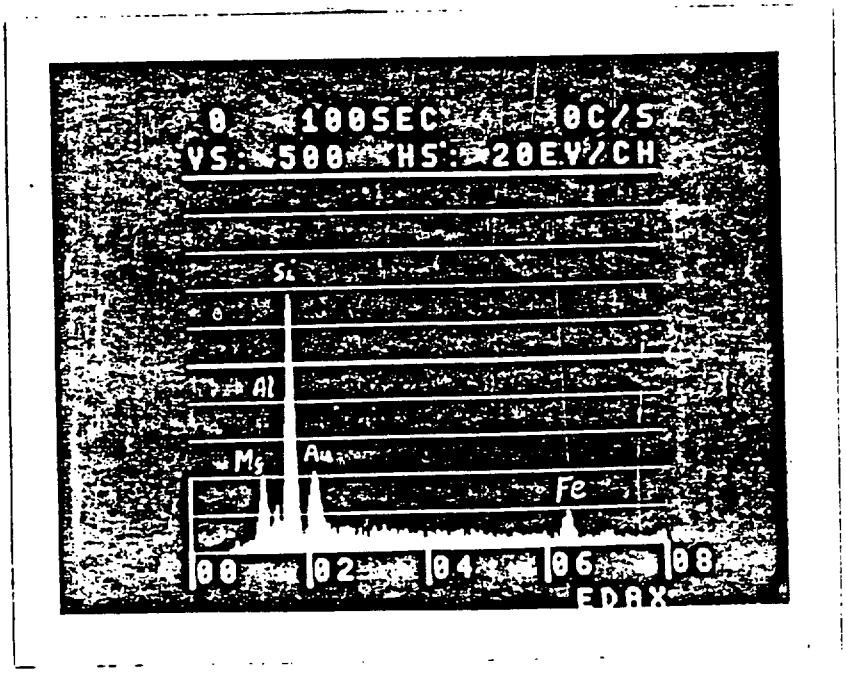


Photo 6A - Spot Mode of Particle Shown Above

FIGURE 4

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Photo 5 - Sample D71 @ 1500X

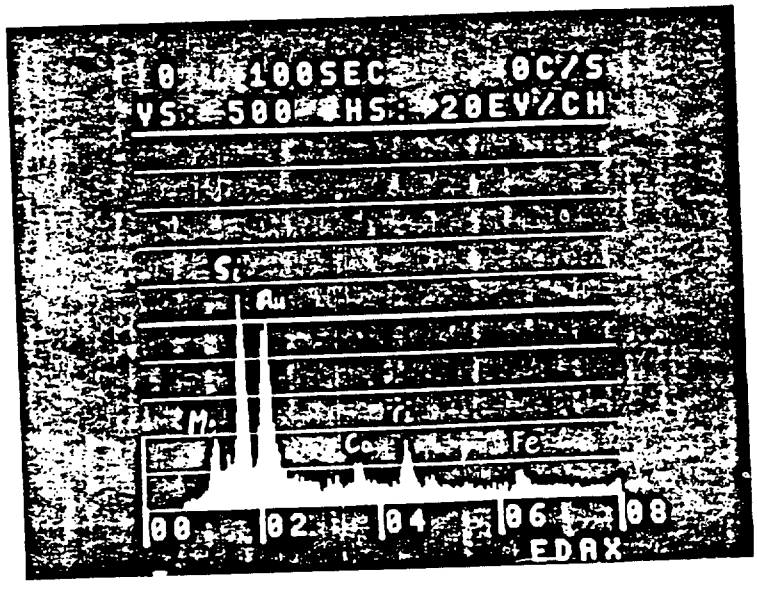


Photo 5A - Spot Mode of Fiber in Above Photo

FIGURE 5

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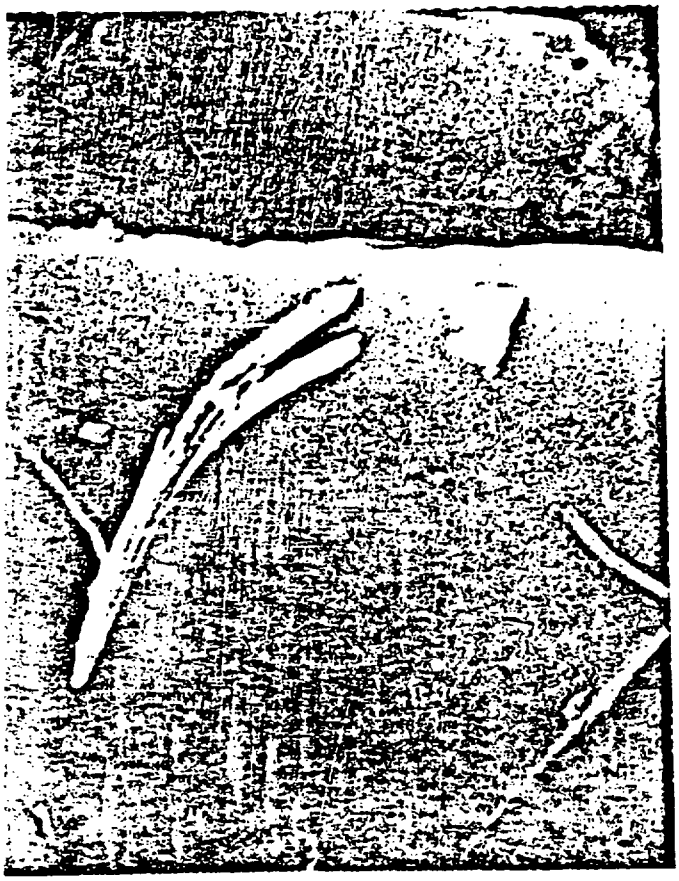


Photo 7 - Sample D-71 @ 15,000X



Photo 8 - Sample D-71 @ 1500X

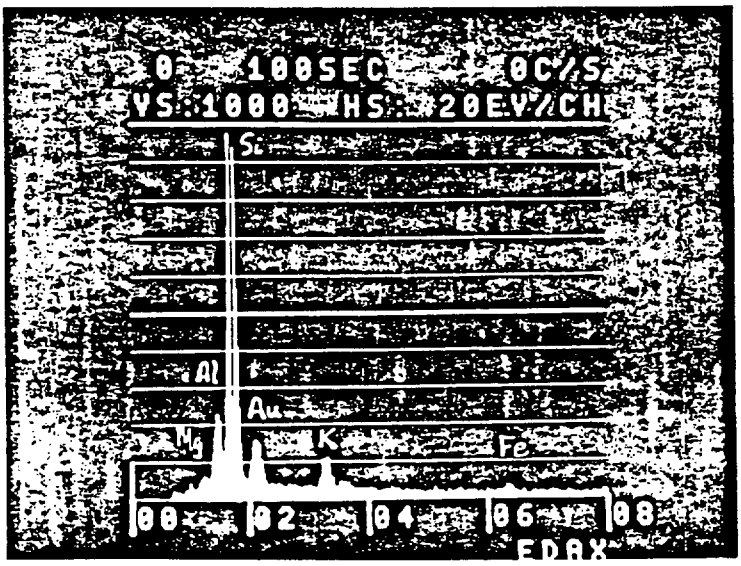


Photo 7A - Spot Mode on Particle Shown in Photos 7 and 8

FIGURE 6

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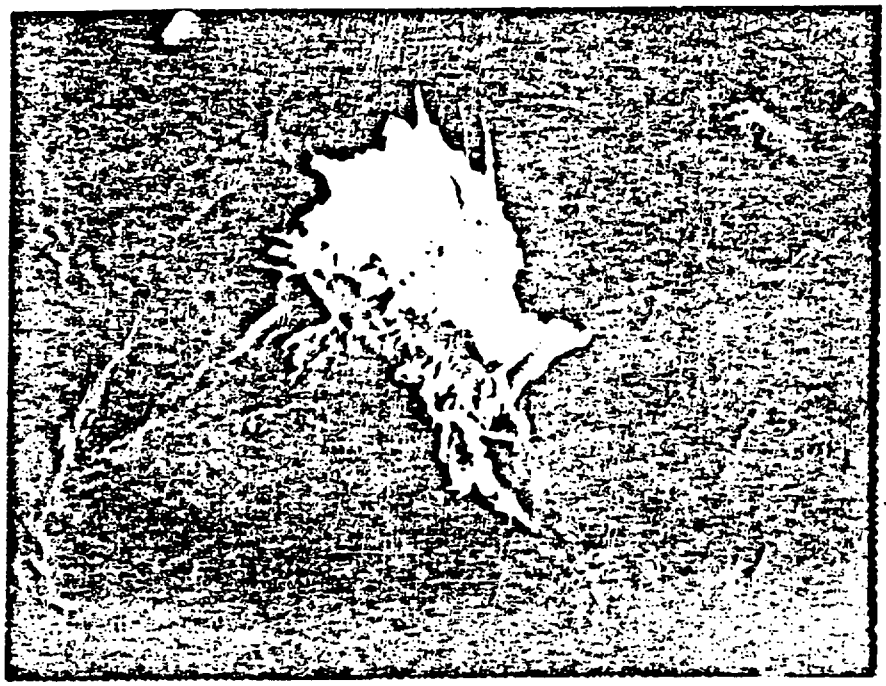


Photo 10 - Sample D-71 @ 5000X

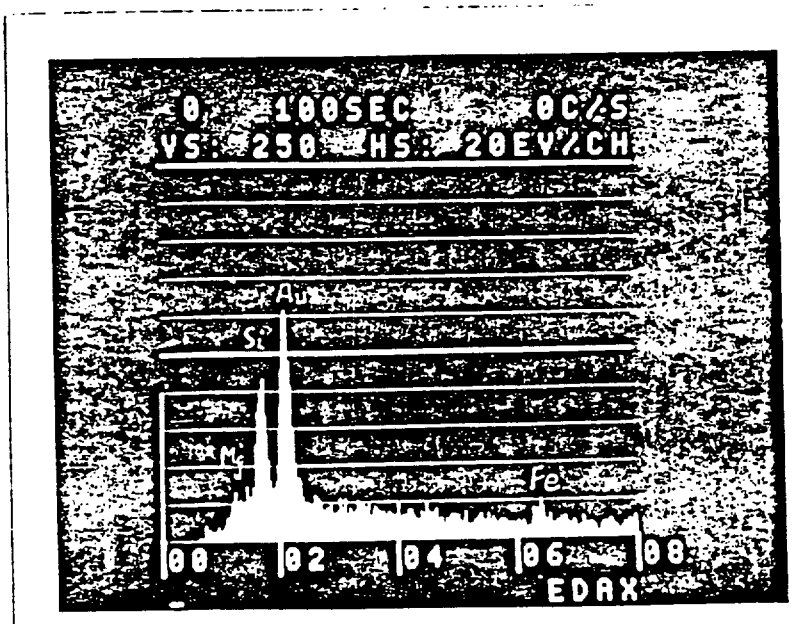


Photo 10A - Spot Mode of Particle Shown Above

FIGURE 7

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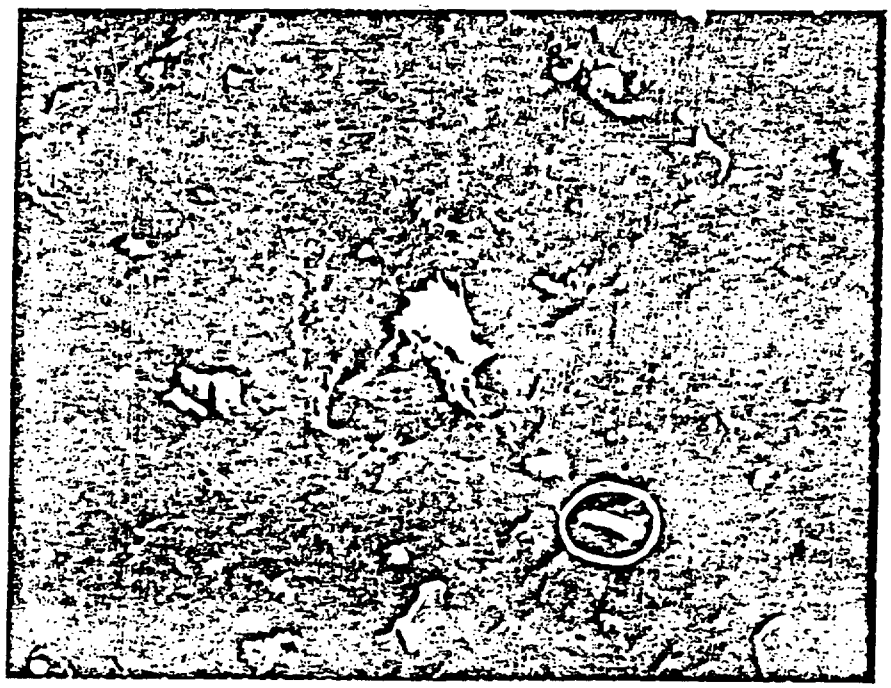
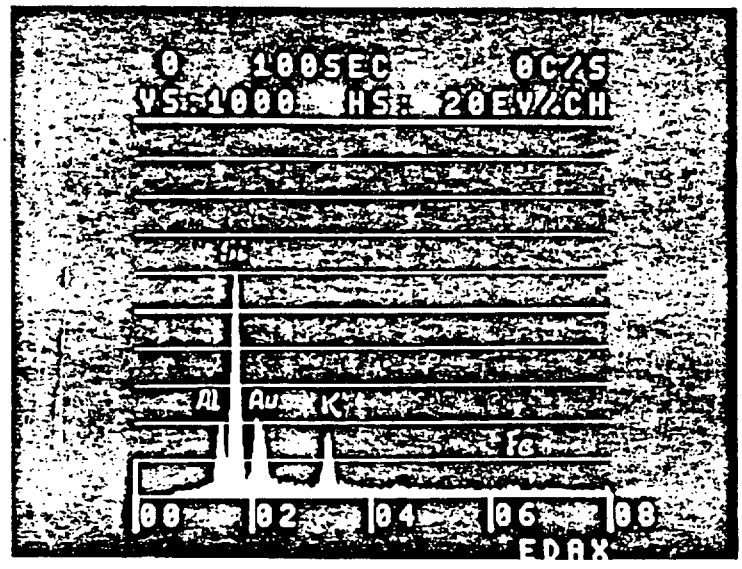


Photo 11 - Sample D-71 @ 1500X



Sample 11A - Spot Mode of Particle Circled Above

FIGURE 8

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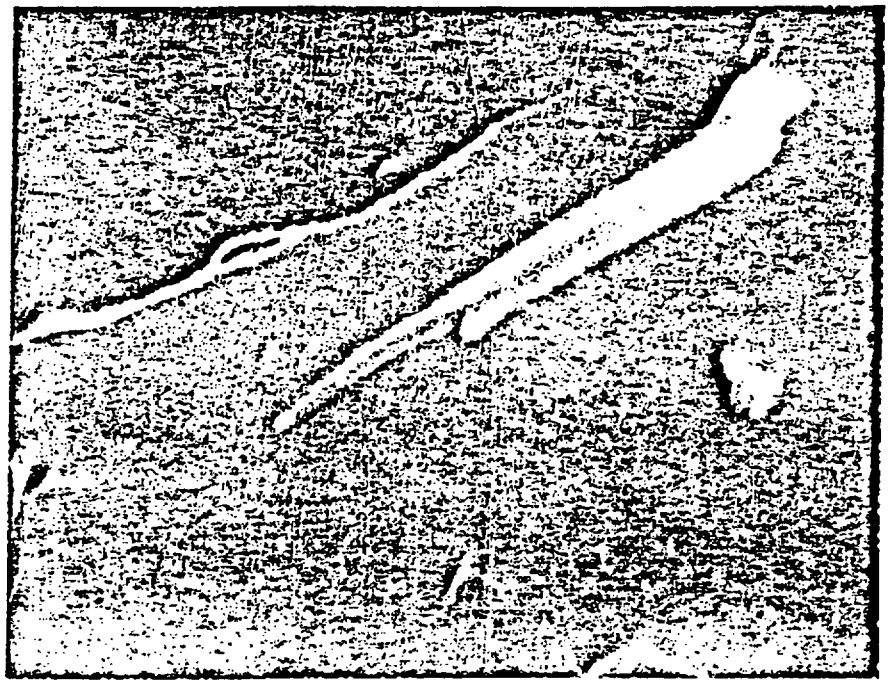


Photo 12 - Sample D-71 @ 20,000X

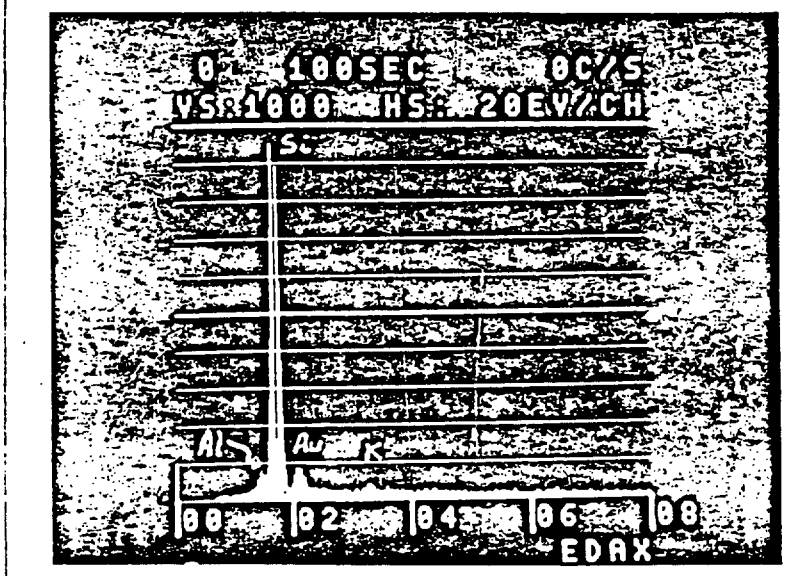


Photo 12A - Spot Mode of Fiber Particle Shown Above

FIGURE 9

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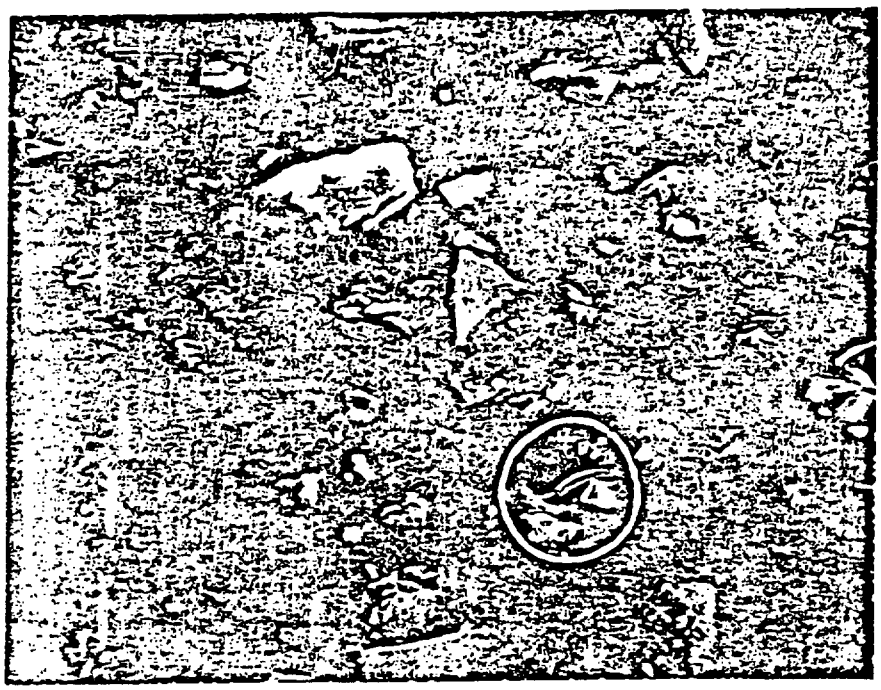


Photo 14 - Sample G-3 @ 1500X

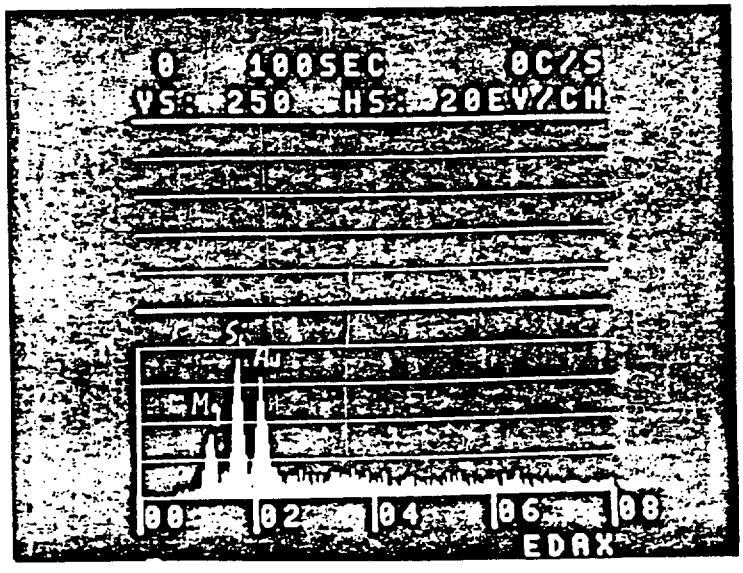


Photo 14A - Spot Mode of Particle Circled Above

A 1000 1

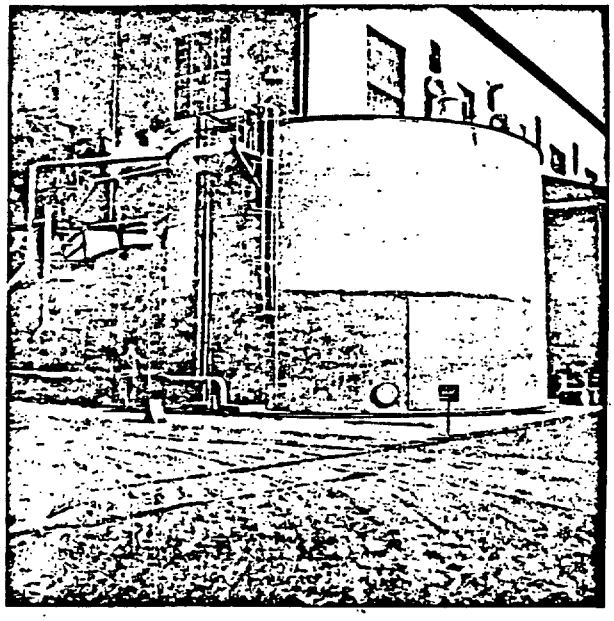
FIGURE 10

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COMMERCIAL SANDBLASTING TEST
KERR-MC GEE CORPORATION - TRONA, CALIFORNIA





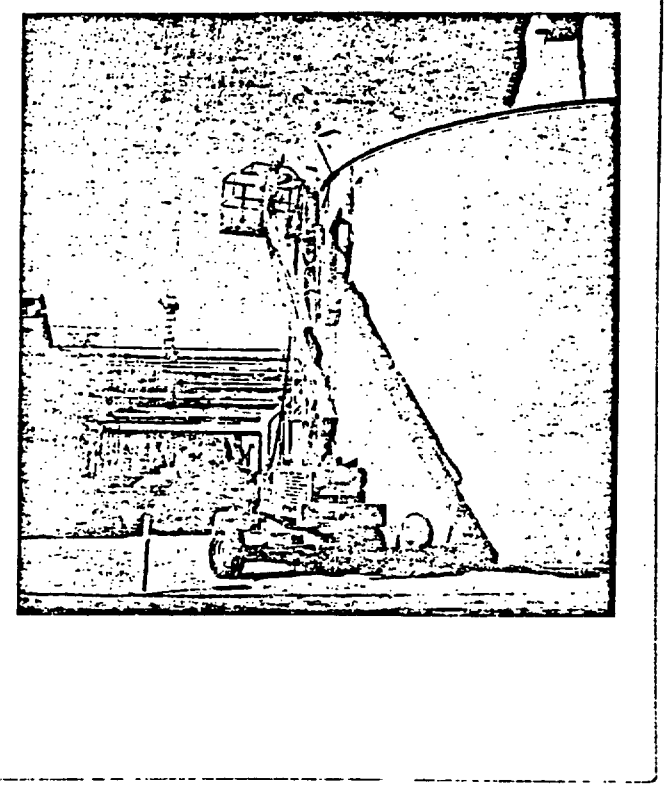


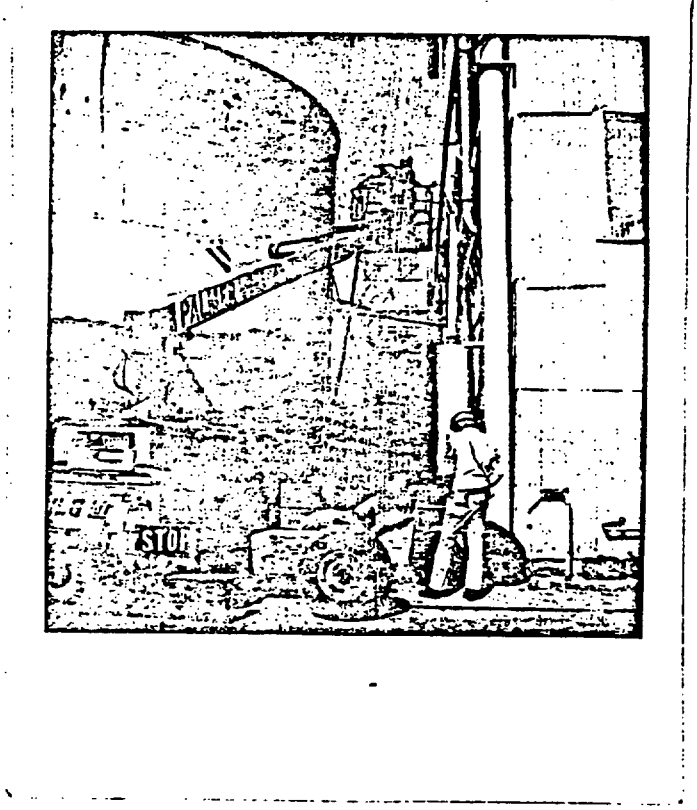
Operators Sandblasting Bottom Portion of Tank

FIGURE 11

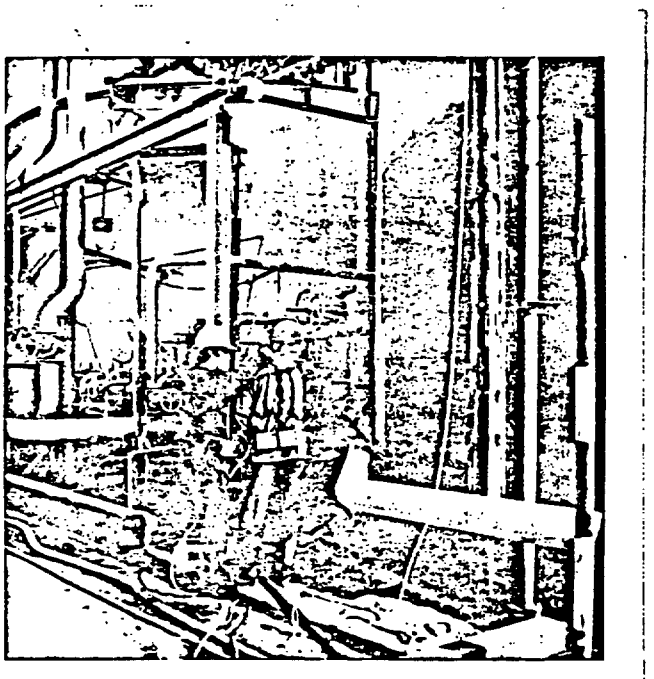
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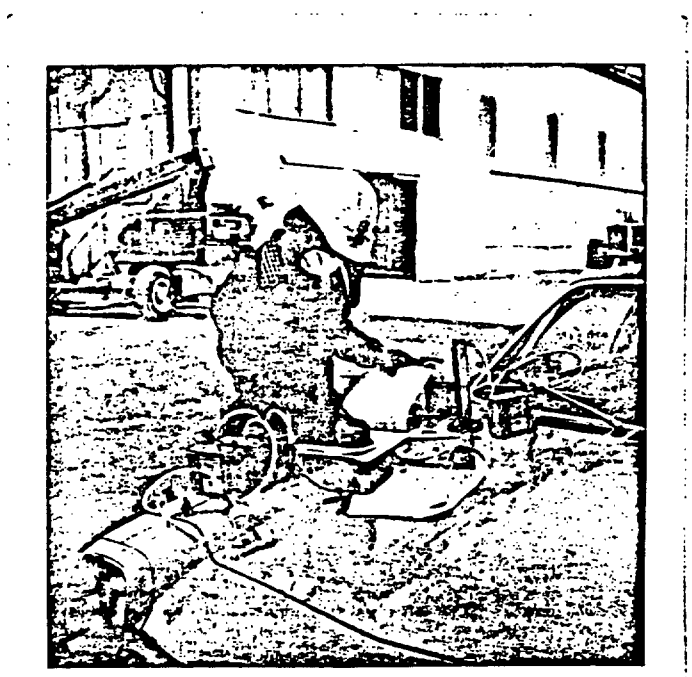
COMMERCIAL SANDBLASTING TEST
KERR-MC GEE CORPORATION - TRONA, CALIFORNIA





Operator on Manlift Sandblasting Top Portion of Tank





A-10313

DOSHA Representative Collecting Samples and Recording Data

FIGURE 12

F. ATTACHMENT I

1) October 30, 1978 Letter of Mr. James Heacock, Supervising Industrial Hygiene Engineer, DOSHA to the Occupational Safety and Health Standards Board.

2) Appendix B - October 30, 1978 DOSHA Letter.

3) Appendic C - October 30, 1978 DOSHA Letter.

A 0004

STATE OF CALIFORNIA
EDMUND G. BROWN JR., Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
1449 WEST TEMPLE
LOS ANGELES, CA 90026

ADDRESS REPLY TO:
1449 WEST TEMPLE
LOS ANGELES, CA 90026

October 30, 1978

RECEIVED
NOV 6 1978
UCC-CALIDRIA
NIAGARA FALLS, N. Y.

Occupational Safety and Health
Standards Board
1006 Fourth Street
Sacramento, CA 95814

Gentlemen

Subject: Public Hearing November 8, 1978
Asbestos Products in Buildings and Structures

The Occupational Health Branch of the California Department of Health evaluated employee exposures to asbestos during the destruction of building materials in an industry-government cooperative consultation program. Results of those tests have bearing on all items of the hearing and specific information on Items 1, 2 and 5.

Previously applied sprayed materials containing asbestos were removed by sanding or sandblasting, or the structure demolished. The employees doing the work were sampled and results analyzed in the same manner as any other compliance or consultation OSHA samples would be handled. (In one study, samples were analyzed by the Federal OSHA Laboratory in Salt Lake City in the hopes that advanced analysis might be available. They repeated the California OSHA Laboratory and NIOSH methods.)

Regarding Public Hearing Questions 1 and 2, the report of employee exposures to airborne asbestos during demolition of a portion of an apartment building previously damanged and burned by a light airplane is attached as Appendix A. The stucco was identified as having been sprayed, and as having contained less than one-half of 1 percent asbestos. In summary, employee exposures during demolition were determined to range from 0.25 to 0.83 fibers longer than 5 microns in length per cubic centimeter of air.

Regarding Public Hearing Question 3, if any exemptions should be granted by the Board, it is recommended that employee exposures be limited to, and employee protection be the same as, that specified in Title 8, CAC 5208 Asbestos.

A 10036

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Question 5. Regarding exemptions for products containing "encapsulated fibers," tests conducted by the Health Department indicate that the fibers are not all "encapsulated" during destructive removal, such as sanding or sandblasting, but rather are also found as free fibers. Four studies were conducted, with reports forming Appendices B (consolidated report of three studies) and C. In all studies, employees were exposed to asbestos fibers, with a range of 0.1 to 7.1 fibers/cm^3 (greater than 5 microns in length).

Very truly yours

James H. Heacock
Supervising Industrial Hygiene Engineer

JHH/cs
enc

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APPENDIX B

TEXTURED COATINGS OF AMERICA, INC.

Because of Legislature concern with regard to future worker exposure to the asbestos contained in asbestos coatings being spray applied, the Occupational Health Branch conducted industrial hygiene determinations of worker exposure to asbestos released from substances (those materials covered by the exemptions introduced by SB 1596), previously applied and aged, during building renovation/repair and demolition operations. Mr. P. Tillisch of Textured Coatings of America (TCA) agreed to provide appropriate opportunities for such determinations during typical industrial operations. This study involved intermittent sampling and analytical determinations over a period of several months.

On three different occasions, the Department of Health, Occupational Health Branch and TCA conducted tests:

(1). August 31, 1976 at 4801 Exposition Blvd., Los Angeles, for building interior coatings

(2). November 16, 1976 at 950 S. Broadway, Los Angeles, for building exterior coatings and

(3). December 17, 1976 at Village Grove Park in the city of Corona for exterior fence coatings.

METHOD

At all three locations sanding or sandblasting was used to simulate building renovation.

At the first location, 4801 Exposition Blvd., Los Angeles, the tests for asbestos were conducted inside the building at the end of a hallway which had been partitioned off from the rest of the building (to keep dust to a minimum).

The enclosed area was approximately 5 ft wide, 12 ft long and 8 ft high. Inside the partitioned area an "employee" did the actual sanding. The "employee" was Scott Tillisch, an employee of TCA. He was observed by Mr. J. Heacock and Mr. L. Beck of the Occupational Health Branch (OHB) and Mr. M. Ordanik of the Southern California Laboratory Section.

The sanding was done with a portable electric hand sander which the operator used on the wall for approximately 2 hours.

Samples were collected in three ways. The first was in the operators breathing zone (OBZ). The second type was an area sample. The area sample utilized the same type of pump and filter-cassette as the OBZ sample but were located

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on an "observer" who walked back and forth throughout the test area. The third type of samples collected were "material" samples. These were collected from the settled dust after the sanding operation by chipping material off of the sandpaper face, or from the material off of the wall before sanding.

At the second location, 950 So. Broadway, Los Angeles, the asbestos test was conducted in the alley behind the building using a commercial sand-blasting machine. An exterior wall approximately 20 feet long was selected and blasted for most of its length to a height of about 5 feet.

Again the three types of samples were collected. Operator Breathing Zone, area, and material sample. A second OBZ sample on the man running the sand mixer for the sandblaster was also collected. The area sample was again collected on an observer walking back and forth through the blasting area, both upwind and downwind of the operation. "Material" samples were from settled sand-dust or from building surface chips.

The people involved were Mr. Scott Tillisch as sandblaster (TCA), Mr. Ron Michalski as mixer-hose tender (TCA), Mr. J. Heacock (CHB), Mr. L. Beck (CHB) and Mr. M. Ordanik (So. Cal. Lab) all as observers. The area samples were collected on Mr. Beck as he observed the operation.

The third location, Village Grove Park, Corona, utilized the same sandblasting equipment as the second location. This time a fence was sandblasted. The fence surrounded a mobil home development. Samples were taken in the vacant lots (#'s 19 and 20) on the North side of the development approximately 30 feet from the Northwest end of the fence. The two lots were approximately 50' x 150' combined. Wind out of the west @ 10 mph.

Samples were collected at the sandblasters OBZ, mixer-hose tender's OBZ and area samples upwind and downwind, both stationary and mobil.

At this third location Mr. H. Rhodes and Mr. B. Ingalls of Union Carbide (New York) represented TCA as consultants and Industrial Hygienists and collected samples along with the Occupational Health Branch. It was mutually agreed that Union Carbide and the Occupational Health Branch would collect samples side by side.

People present were Mr. Paul Tillisch, T.P. of TCA; Scott Tillisch as hose-tender-mixer; Ken Schorr as sandblaster; Mr. Rhodes and Mr. Ingalls of Union Carbide; and Mr. J. Hinton and Mr. L. Beck of the Occupational Health Branch.

Again the air in the sandblaster and mixer-hosetender's OBZ's was sampled. Area samples included fixed location samples on the fence post upwind and downwind, and roving samples on Mr. Rhodes who walked back and forth through the area. Settled dust was again collected as a material sample after the sandblasting ceased.

For all three locations sample "Blanks" were kept for analytical comparison. Laboratory analysis utilized OSHA and NIOSH approved methods.

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Data:

LOCATION 1 1901 Exposition Blvd., Los Angeles

	Sander	Area	
Fibers/cc	1.7	0.3	Both samples simultaneously* within 10 ft of s
5 Microns	1.1	0.9	" "
in length	0.5	0.3	" "
		0.2	" "

Material - 1% Chrysotile bound in matrix: Free fibers released with grinding abrasion

- Latex Base Paint (Vinyl-Acrylic)

LOCATION 2 950 South Broadway, Los Angeles

	Sandblaster	Mixer-Hosetender	Area	
Fibers/cc	1.5 (filter outside of hood)	0.4	1.6	All 3 sampled simultaneously*
5 Microns	3.5 "	0.7	1.2	"

Material - Aldyd Base; 3-5% Chrysotile Asbestos
Within 15 to 20 feet of source

LOCATION 3 Village Grove Park (Lots 19 and 20), Corona

	Sandblaster	Mixer-Hosetender	Area	
		Before Blasting	0.3 (Stationary Backgro Upwind	
			0.2 (Moving Background)	
Fibers/cc			0.1 (Stationary Backgro Upwind*	
5 Microns	1.6 (Filter outside of hood)	1.4	0.1 (Moving during blas Never downwind	
	7.1 "			
	6.6 "	2.2(Upwind)	0.2 " " "	
	3.7 (Filter inside of Hood) "	0.5 "	" " "	
	2.1 (Filter outside of Hood)	0.2 "	1.9 (Stationary during blasting) Downwi	

Material - 1% Chrysotile Within 20 to 40 feet o

* Horizontal lines distinguish those samples collected in the same time frame and/or simultaneously.

Variables:

ALL LOCATIONS

Several variables were not accounted for in the study concerning all three locations. First the sanding medium was not analyzed for asbestos. At location 1, this would have been the sandpaper used and, at locations 2 and 3, the sand used for sandblasting. Secondly the building material on which the textured coating had been applied was not analyzed for asbestos content. At the first location this would have been the wall plaster, the second location, a stucco wall reinforced with wood, and the third location a metal fence. Thirdly, the area samples varied in distance from the source and were not constant with regard to wind direction except in a few instances. Finally, no "before" and "after" air samples were collected to establish an ambient asbestos concentration, except at the third location. Ambient air samples at the third location revealed that there is asbestos from unknown sources contaminating the air which might be the subject of an environmental study.

However, in view of these variables, we feel the results would be changed insignificantly had they been accounted for. The bag was labeled "100% sand"; the sandblasting went only to the surface of the plaster, stucco and metal; and the chemist who analyzed the samples is an experienced expert in the field of asbestos determinations.

RESULTS

The data shows that there is a definite exposure to asbestos when employees or workers sandblast or sand coatings containing asbestos and that this exposure is present in the immediate area. In this case, the immediate area referred to is within a 10 foot radius of the source in a non-windy condition and within a 40 foot radius downwind in windy conditions.

In any case, at all three locations there was an employee exposure of at least 1 fiber/cc, and up to 4 fiber/cc as an average. The area samples also showed exposure into the 1 to 2 fiber/cc range. And finally the mixer-nosetender exposure range was from 0.5 to 2.0 fibers/cc.

DISCUSSION

The current standard for asbestos is 2 fibers/cc greater than 5 microns in length. However, medical monitoring is required at 1 fiber/cc on an 8 hr. time weighted basis.

Since the results indicate employee exposure to 1 fiber/cc and greater, we conclude that there is a high possibility of harmful exposures to employees during building renovation.

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APPENDIX C

ASBESTOS SAMPLING DURING COATING DESTRUCTION

Many questions have been raised regarding the levels of asbestos fibers released during the removal of paint type coatings containing asbestos. In this investigation, air samples were collected during the destruction of a high performance coating containing 2.1% asbestos. A 40 foot diameter, 25 foot high steel tank spray coated in 1973 was sandblasted to bare metal. Since sandblasting represents an extreme condition, it provides an estimate of the highest employee or community exposure to asbestos.

METHOD

Air samples were collected in the breathing zones of workmen using personal sampling equipment. Open face filter cassettes containing 37 mm Millipore AA filters on a cellulose backing pad were attached to the employee's respirator straps or lapel. MSA Model G portable sampling pumps were used to maintain a flow rate of 1.5 liters per minute. Flow rates were calibrated in the field with a Brooks type 1355-O1A1AAA rotameter. Sampling times varied from 5 to 15 minutes. Thirty minute background samples were collected before sandblasting.

Unexposed blanks were also submitted. Samples were collected on the three workmen, two sandblasters and one pot tender. Sandblasters wore airline respirators to protect them from silica exposure.

ANALYSIS

Asbestos sample filter cassettes were sealed in the field, packaged and forwarded to the U. S. Department of Labor, OSHA Laboratory in Salt Lake City for analysis.

Samples were analyzed by phase contrast microscopy. Selected samples were also analyzed by dispersion staining and electron microscopy.

Results of the laboratory analysis were forwarded as soon as they became available. The optical microscopic results are summarized in Table 1. Asbestos fibers were counted by the standard NIOSH method. Blank sample cassettes submitted with the asbestos samples were counted by optical methods.

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APPENDIX C

Three unused filter cassettes were submitted. No fibers were detected on two filters, one filter was reported to have 0.01 fiber/field (100 fields counted).

Background samples collected before sandblasting were reported below the detection limits for asbestos.

In addition, JK-32, collected during sandblasting of a section of the tank sandblasted to bare metal earlier in the day was also reported as below the detection limit for asbestos.

To gain additional information about the fibers present, filters were further analyzed by dispersion staining. In a study of sample JK-3, by dispersion staining, 16 of 110 fibers were identified as chrysotile asbestos. Other samples were stained. The fibers present were found similar to JK-3. The nonasbestos fibers were identified as plant fibers and fiber glass.

RESULT

Time weighted average concentrations were calculated from the optical microscopic analysis. Exposures to the workmen are listed in Table 2. Sandblaster TWA exposures were calculated to be 0.2 and 0.3 fiber/cm^3. The pot tender's average was 0.1 fiber/cm^3, greater than 5 μ in length.

DISCUSSION

Employee exposures were within the present Cal/OSHA standard of 2 fibers/cm^3, greater than five microns in length. In addition, workers with the greatest asbestos exposure were protected by the airline respirators worn to prevent silica exposure.

Sandblaster #1 did not sandblast all day. His calculated time weighted average, 0.2 fibers/cm^3, represents a partial day of sandblasting. Sandblaster #1 was not used between 13:15 and 15:30.

Asbestos fiber counts of mixtures of air contaminants containing asbestos are slow and tedious. The standard phase contrast optical microscopic

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method was relied upon to determine worker exposures. In this method of analysis, the procedure allows for information gained through additional testing to be used to more precisely identify countable fibers. The analyst may reject fibers identified as not being asbestos. Dispersion staining and the use of cross polarizing filters, or a first order red retardation plate, give additional information regarding the nature of the fibers. Fibers without the correct morphology or other characteristics, recognized as not asbestos, are not counted. Fibers of doubtful identity are included with the asbestos count.

The results of electron microscopic analysis and dispersion staining quantify the proportion of the total fibers which are actually asbestos. These percentages were between 12 and 14%. Although the percentages are small, it is important to note that free asbestos is released. Analysis of blank samples ruled out the possibility of significant contamination from either the blasting sand or desert air.

/flw
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ATTENDIX C
Table 1

SAMPLE #	OPERATOR	TIME ON	TOTAL TIME (MINUTES)	FIBERS/CC	COMMENT
JK-1	Sandblaster-1	8:21	27	< D.L.	Background (Desert Air) Sample before sand blasting
JK-2	Pot Tender	8:21	27	< D.L.	Background (Desert Air) Sample before sandblasting
JK-3	Sandblaster-1	8:54	20	0.49	Under Blasting Hood.
JK-4	Pot Tender	8:54	32	0.35	Two Sand Blasters working
JK-5	Sandblaster-2	9:09	11	Membrane marred	Blasting at ground level
JK-6	Sandblaster-1	9:14	17	0.57	On Scaffold
JK-7	Sandblaster-2	9:20	16	0.31	Ground Level
JK-8	Pot Tender	9:26	20	No membrane in cassette	Two Blasters working
JK-9	Pot Tender	9:46	12	< D.L.	Two Blasters working
JK-10	Blank	—	—	None	———
JK-11	Sandblaster-2	9:36	5	0.63	Ground Level
JK-12	Sandblaster-2	9:41	6	0.71	Ground Level
JK-13	Sandblaster-2	9:47	5	1.4	Ground Level
JK-14	Sandblaster-2	9:55	6	1.6	Ground Level - Overlap JK-1
JK-15	Sandblaster-2	9:55	12	0.75	
JK-16	Pot Tender	9:58	22	0.17	
JK-17	Sandblaster-2	10:01	6	< D.L.	Hole in filter - Overlap J:
JK-18	Sandblaster-2	10:07	7	1.3	Ground Level
JK-19	Sandblaster-2	10:13	10	0.3	Blasting ½ of sample
JK-20	Pot Tender	10:20	22	0.24	11 minutes break
JK-21	Sandblaster-2	10:24	10	0.32	Entire sample break
JK-22	Sandblaster-2	10:34	18	0.91	On man lift
JK-23	Pot Tender	10:43	16	1.02	
JK-24	Sandblaster-1	10:47	16	1.27	On ground
JK-25	Blank	—	—	None	———

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APPENDIX C
Table 1 (Continued)

SAMPLE #	OPERATOR	TIME ON	TOTAL TIME (MINUTES)	FIBERS/CC	COMMENT	
JK-26	Sandblaster-2	10:52	16	< D.L.	On lift above #1	
JK-27	Sandblaster-1	11:01	6	0.38	#2 above on lift	
JK-28	Pot Tender	11:00	17	0.40		
JK-29	Sandblaster-1	11:07	11	0.67	#2 still above	
JK-30	Sandblaster-2	11:09	14	0.45	Blasting time: 9 min	
JK-31	Pot Tender	11:18	8	< D.L.		
JK-32	Sandblaster-2	12:50	5	< D.L.	Blasting Bare Metal Area.	
JK-33	Sandblaster-2	13:04	11	< D.L.	Man lift	
JK-34	Sandblaster-1	13:09	5	0.95	Ground	
JK-35	Sandblaster-2	13:17	7	0.60	On man lift	Blasting time 6 min
JK-36	Sandblaster-2	13:24	9	0.66	On lift	
JK-37	Sandblaster-2	13:34	14	< D.L	On lift	7 min blastin
JK-38	Sandblaster-2	13:48	17	0.32	Lift	11 min blastin
JK-39	Sandblaster-2	14:06	11	0.19	Lift	
JK-40	Sandblaster-2	14:17	17	0.40	Lift	Blasting over operator's hea (cat walk)
JK-41	Sandblaster-2	14:35	25	0.23	Lift	15 min blastin
JK-42	Sandblaster-2	15:00	21	No count possible	Lift	11 min blastin
JK-43	Sandblaster-2	15:21	15	0.46	Lift	
JK-44	Blank	—	—	0.01	fibers/field (100 fields)	

D.L. = Detection Limit

All samples Operator Breathing Zone

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APPENDIX C
Table 2.

Pot Tender. Time Weighted Average Asbestos Exposure.

SAMPLE	TIME(Min.)	C FIBERS/CM^3	CALCULATIONS
JK-2	27	0	* Average Exposure = $\frac{\Sigma CT}{\Sigma T}$ = concentration of unsampled.
JK-4	37	0.35	
JK-8	20	No count	TWA = $\frac{\Sigma CT}{480} = \frac{97.5}{480} = 0.20$
JK-9	12	0	
JK-16	22	0.17	= 0.2 fibers/cm^3, >5 μ
JK-20	22	0.24	
JK-23	17	1.02	
JK-28	18	0.40	
JK-31	8	0	C = fibers/cm^3
Unsampled	182	0.28*	T = Time (minutes)

Sandblaster. #1 Partial day time weighted average.

SAMPLE	TIME (Min.)	C FIBERS/CM^3	CALCULATIONS
JK-1	27	0	No exposure between JK-6 and JK-24..
JK-3	20	0.49	
JK-6	17	0.57	TWA = $\frac{\Sigma CT}{480} = \frac{57.2}{480}$ = 0.1 f/cm^3, >5μ
JK-24	16	1.27	
JK-27	6	0.88	C = fibers/cm^3
JK-29	11	0.67	T - Time (minutes)
JK-34	5	0.95	

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APPENDIX C
Table 2. (Continued)

Sandblaster 2. Time Weighted Average Asbestos Exposure.

SAMPLE	TIME (Min.)	C FIBERS/CM^3
JK-5	11	Marred
JK-7	16	0.31
JK-11	5	0.63
JK-12	6	0.71
JK-13	8	1.4
JK-14	Overlap	JK-15
JK-15	12	0
JK-17	Overlap	JK-15
JK-18	7	1.3
JK-19	10	0.3
JK-21	11	0.32
JK-22	18	0.91
JK-26	16	0
JK-30	17	0.45
JK-32	5	0
JK-33	11	0
JK-35	9	0.6
JK-36	9	0.66
JK-37	15	0
JK-38	17	0.32
JK-39	12	0.19
JK-40	17	0.40
JK-41	12	0.23
JK-42	17	No count
JK-43	25	0.46
Unsampled	52	0.38*

* Average Exposure

CALCULATION

*Average exposure = $\frac{\Sigma CT}{\Sigma T}$ = concentration of unsampled

TWA = $\frac{\Sigma CT}{480} = \frac{130.4}{480} = 0.27$

= 0.3 fibers/cm^3, >5 μ

C = Concentration (fibers/cm^3)

T = Time (minutes)

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G. ATTACHEMENT II

Union Carbide Report of Cooperative Air Monitoring at Village Grove Park.

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AIRBORNE ASBESTOS COUNTS

for

Textured Coatings of America, Inc.
(Village Grove Trailer Park, Lots 19 and 20)
Corona, California

Date Sampled: December 17, 1976
Date Reported: April 1, 1977

Samples Collected By: B. L. Ingalls
Union Carbide Corporation

Samples Analyzed By: B. L. Ingalls & G. J. Spencer
Union Carbide Corporation

Reported By: H. B. Rhodes
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

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OBJECTIVE

To measure the airborne asbestos fiber concentrations generated during the removal of an asbestos-containing maintenance coating from a sheet metal fence by sand-blasting.

DESCRIPTION OF OPERATION

The test was run at Village Grove Trailer Park, Lots 19 and 20 in Corona, California. The park was surrounded by a galvanized metal fence about 5' high that had been painted about five years previously. The metal was first primed and then painted with an alkyd-based maintenance coating containing about 5% asbestos. The paint also contained mica, talc (non-tremolitic), fiberglass, and perlite.

The sandblasting was done with a portable unit consisting of a compressor and a blasting unit. The latter had a sand storage tank about 1' in diameter by 3 1/2' long which fed silica sand through a lever operated control device and a heavy hose to a blast nozzle, under the control of the operator. One man handled the blasting nozzle while the other operated the compressor, assisted with the hoses, but primarily operated a lever on the sand delivery unit to keep the sand flowing. The nozzle operator wore a conventional sand-blasting hood with air openings on the sides..

During the blasting operation one man stood about 2' from the fence and moved the nozzle, held about 3-6 inches from the fence, in short arcs until the impinging sand removed the paint down to the base metal. Bonding was excellent and it took at least several passes of the blast to remove the paint. The material removed was finely pulverized. The bottom 1 1/2' of the fence was not hand-blasted to avoid raising extraneous dust from the dry ground at the base of the fence. The weather was clear and warm with a light, variable breeze blowing from left to right in approximately the same direction as the fence.

SAMPLE COLLECTION

The following types of samples were collected during the test:

1. Background samples prior to testing were collected at the fence, ~4 1/2' from the ground about 100' apart. (Spanned the section to be sand-blasted.) (G-16 & F-44)

2. A sample about 40' downwind, on the fence about 5' above the ground, during the last 25 minutes of sand-blasting.(G-3)

3. Personal samples on an observer in an area generally 25-35' from the blasting operation and approximately perpendicular to the blasting. (A-86, A-81, J-89)

4. Personal samples on both the helper and the sand-blasting operator. All operator samples were external to the hood except X-2.

   Helper - G-48, X-8, C-15, X-4
   Operator - D-71, X-14, G-34, X-2, X-3

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COUNTING EQUIPMENT AND PROCEDURES

All samples were collected with battery-powered air pumps (M.S.A.), calibrated to 2 liters per minute on Millipore membrane filters of 0.8μ porosity. The samples were mounted and counted in accordance with the procedure of Bayer, Zumwalde, and Brown (Bureau of Occupational Safety and Health, February 1969). Counting was done with a Nikon microscope at 400X utilizing a Poton reticle with a 0.0062 mm^2 field area. One hundred fields were counted for all samples.

These samples proved to be particularly difficult to count. Out of the total of nine personal samples from the blast operator and the helper, six were loaded with dust to a level where filter areas were frequently obscured. When such an area occurred, the counter went on to another field. There is no way to tell how this may have influenced the results. Our normal practice in this situation is to resample, but considering the difficulties this would entail, the filters were used.

In addition to this problem, the nature of the samples puts an extreme strain on the method. Thus:

1. Fiber concentrations were low with 0.58 fibers/field the maximum and 0.2 fibers/field more or less typical. This is well below the 1-5 fibers/field range recommended by NIOSH.

2. The fibers counted were in the 5-15μ range so that the "5μ decision" was a frequent requirement.

3. There were substantial concentrations of mica "chips" present. These can generally be recognized as not asbestos but certain shapes around 5μ in length can become undistinguishable.

These factors of low fiber concentration on the filter, filter size distribution, and potentially interfering "fibers" result in a high degree of operator discretion in the determination of the total number of asbestos fibers counted. When this possible variation is combined with the short sample times substantial variations can result.

In view of these uncertainties, a modification was made in the procedure to report two categories of fiber:

1. Obvious chrysotile asbestos. Either long and curved, or distinctly thin and slightly curved in the 10-20μ range.

2. Possible asbestos fiber: Particles which did not have obvious identifying asbestos features but met the L/D >3, >5μ requirements and were dark and fiberlike under phase-contrast illumination.

When there was any doubt about a fiber's identity, it was included in the appropriate class. The total of both classes would be the value ordinarily reported as asbestos. Particles which were obviously not asbestos were not counted. This would include such things as unbroken fiberglass, mineral flocks with non-parallel sides, and particulate that appeared bright under phase contrast. It should be noted that the only known source of asbestos in this formulation was the 5% by weight chrysotile. (Note that the 2% asbestos figure reported by DOSHA in Appendix B is in error.)

A 16301

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RESULTS AND DISCUSSION

A description of each sample and the respective fiber concentrations are shown in Table I. The data obtained by Counter A are presented graphically in Figure I. Where paired results are available Counter B was high six times and Counter A three times. The differences, without regard to sign ranged from 0.1 to 1.1 fibers/cc and averaged 0.3 fibers/cc. In view of the counting difficulties on these slides we consider this to be good agreement for operators in the same laboratory counting the same slides.

The operation of the sand-blasting equipment was too erratic to provide a meaningful estimate of operator TWA exposure for normal operation. Using just the time periods during the actual blasting operations, the time-weighted averages were:

$$\text{Operator} - \frac{(10)(2.2)+(11)(3.2)+(8)(3.28)+(14)(1.68)+(22)(1.76)}{(10)+(11)+(8)+(14)+(22)} = \frac{145.68}{65} = 2.2 \text{ fibers/cc } >5\mu$$

$$\text{Helper} - \frac{(10)(1.03)+(23)(1.1)+(14)(0.15)+(22)(0.06)}{(10)+(23)+(14)+(22)} = \frac{39.02}{69} = 0.6 \text{ fibers/cc } >5\mu$$

The measured TWA exposure for this particular 8-hour day would then be:

$$\text{Operator} - \frac{145.68}{480} = 0.3 \text{ fibers/cc } >5\mu$$

$$\text{Helper} - \frac{39.02}{480} = 0.08 \text{ fibers/cc } >5\mu$$

A-6002

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TABLE 1

SUMMARY OF AIRBORNE ASBESTOS FIBER COUNTS DURING SAND-BLASTING OF ASBESTOS-CONTAINING MAINTENANCE COATING

Description of Operation	Sample Data No.	Time On	Time Off	Total Min.	Airborne Fiber Concentrations (Fibers/cc >5μ) Operator "A" Obvious Chrysotile fibers 100 fields	f/cc	Possible Asbestos fibers 100 fields	f/cc	Total Asbestos fibers 100 fields	f/cc	Operator "B" Total Asbestos fibers 100 fields	f/cc	Comments
Pretest Controls													
On fence, left side of area to be sand-blasted. ~4 1/2' above ground.	G-16	10:35	10:56	21	0	0	2	0.07	2	0.07	-	-	
On fence, ~100' from G-16. ~5' above ground.	F-44	10:42	10:59	17	0	0	0	0	0	0	2	0.08	
Personal sample on observer ~25' from fence and moving parallel to fence.	A-86	10:39	10:52	13	0	0	2	0.11	2	0.11	4	0.21	
Observer (During Sand-Blasting)													
Personal sample on observer ~20-30' from fence and moving parallel to fence.	A-81	11:12 11:25	11:18 11:27	6 2 8	0	0	1	0.09	1	0.09	-	-	
Same as A-81.	J-89	12:26	12:52	26	0	0	1	0.03	1	0.03	-	-	
Area sample on fence. 5' above ground and ~40' downwind. (In lieu of observer)	G-3	1:35	2:00	25	7	0.19	22	0.61	29	0.7	21	0.6	
Helper (During Sand-Blasting)													
Personal sample. Assisting with hoses. Operating sand feeding equipment.	G-48	11:10 11:24	11:18 11:26	8 2 10	1	0.07	14	0.97	15	1.03	9	0.6	
Same as G-48.	X-8	12:25	12:48	23	10 -	0.30 -	18 -	0.54 -	28 45	0.84 1.35	60	1.8	Heavily loaded; ha to count second sl
Same as G-48.	C-15	1:08	1:22	14	1	0.05	2	0.10	3	0.15	-	-	
Same as G-48.	X-4	1:36	1:58	22	0	0	2	0.06	2	0.06	9	0.3	
Blasting Operator (During Sand-Blasting)													
Personal sample. Operator handling sand-blasting nozzle, standing ~2' from fence.	D-71	11:10 11:24	11:18 11:26	8 2	7	0.48	25	1.72	32	2.21	-	-	Heavily loaded, ha to count.
Same as D-71.	X-14	12:25	12:36	11	13 -	0.82 -	30 -	1.88 -	43 58	2.70 3.64	- 75	- 4.70	Heavily loaded; ha to count second sl
Same as D-71.	G-34	12:38	12:46	8	5	0.43	33	2.84	38	3.28	39	3.36	Heavily loaded; ha to count.
Same as D-71 except inside of hood.	X-2	1:08	1:22	14	8	0.39	26	1.28	34	1.68	-	-	" "
Same as D-71.	X-3	1:36	1:58	22	21	0.66	35	1.10	56	1.76	53	1.66	" "

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AIRBORNE ASBESTOS FIBER COUNTS DURING SANDBLASTING

OF ASBESTOS-CONTAINING MAINTENANCE COATING

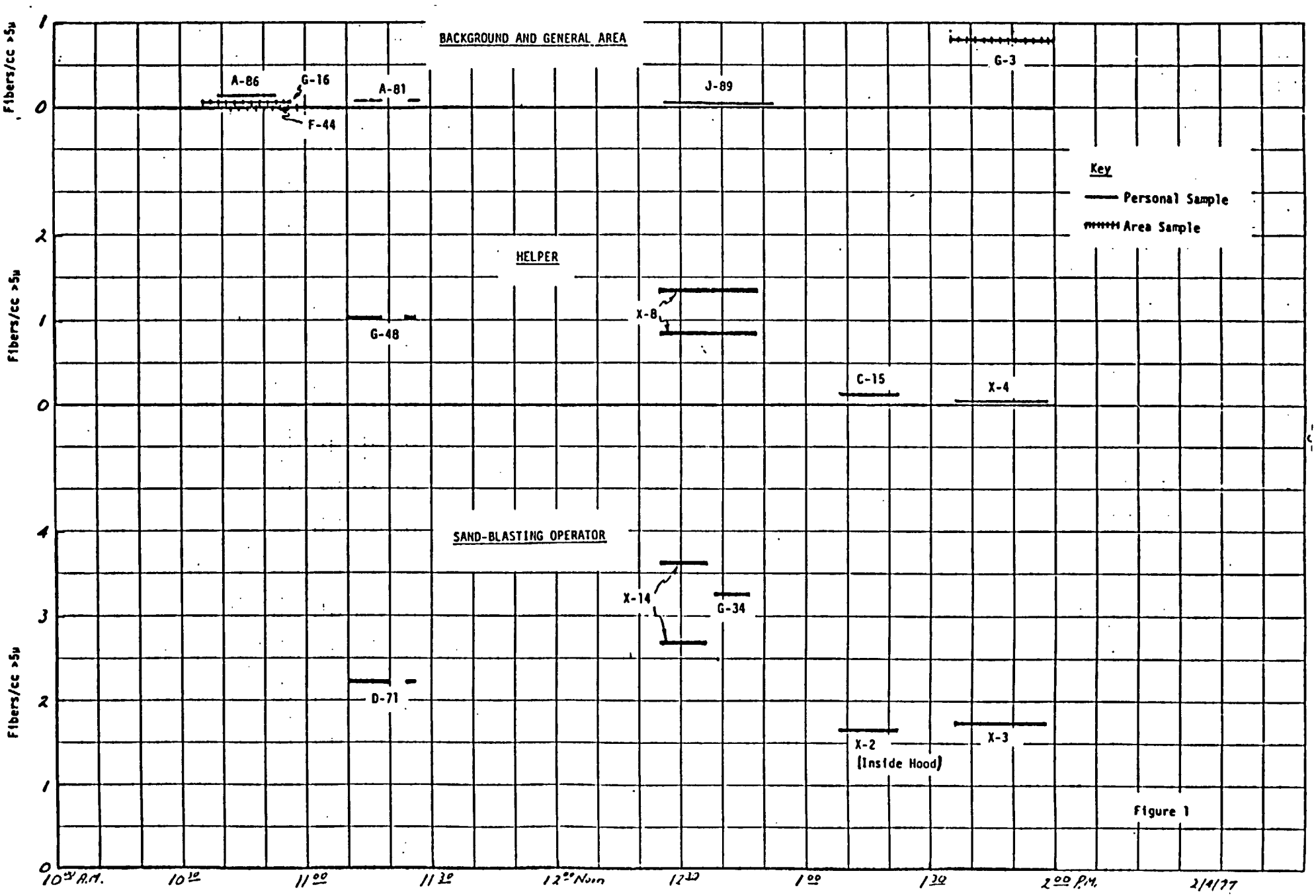


Figure 1

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H. ATTACHMENT III

Protocol of Cooperative Air Monitoring Test at Kerr-McGee, Trona, California.

A 10305

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UNION CARBIDE CORPORATION • METALS DIVISION • P. O. BOX 579 • NIAGARA FALLS, N.Y. 14302 • TEL: 716-278-3376

January 13, 1978

Mr. James Heacock
Occupational Health Section
California Department of Health
2151 Berkeley Way
Berkeley, CA 94704

Dear Mr. Heacock:

The suggested protocol for the cooperative test that we discussed in your office is attached. As you requested, it has been set up so that the Department does the actual sample collection.

Plans are well along to conduct the test on one or more large tanks in the Trona area that have been coated with zinc-rich primer. The only hold up is satisfactory verification of composition of the primer. We would like to go ahead and plan to conduct this test during the week of January 23, 1978, preferably on Tuesday the 24th.

Please let me know if this is satisfactory so we can finalize on a date and the other arrangements.

In view of the time that has passed since the original hearings and the number of new people involved, it seems appropriate to comment on two questions relevant to the previous testing results reported in a letter of June 1, 1977 from Jerome A. Lockner, M.D. to the Honorable Jack R. Fenton, i.e.:

1. The appropriateness of sandblasting as a representative test method.

2. The accuracy of the previous counts.

We have been informed by a large manufacturer of the high-performance maintenance coatings of particular interest here that certain of these coatings are sandblasted as a routine procedure. Usually it is a light "brush" blasting to remove rust spots and loose coating but occasionally complete removal takes place. Sandblasting thus represents an extreme condition and should thus be a reasonable way to approximate the upper limits of exposure.

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As we discussed several times, in the test where Cal/OSHA and Union Carbide collected side-by-side samples during a sandblasting operation, both laboratories found asbestos counts of several fibers/cc or more when counting by the routine NIOSH procedure. It is well recognized that the procedure has very serious limitations for dusts of the type generated during sandblasting. Subsequent examination by Union Carbide of several of the filters using scanning electron microscope techniques suggested that both laboratories may have counted substantial numbers of non-asbestos particles as asbestos and that free asbestos fibers were extremely rare.

Over the past year the Federal OSHA Laboratory at Salt Lake City has adopted more sophisticated optical techniques to distinguish asbestos from other particulate matter and are quite possibly the most skilled laboratory in the country in this area. I have discussed our problem with the Director, Mr. Floyd Madsen, and he is agreeable to count a reasonable number of samples. It will be appropriate for you to make a written request for this assistance at the time the samples are submitted.

Please let me know if you have any problems with this proposal.. We are looking forward to participating in what appears to be the first carefully defined test of asbestos exposure in this type of application.

It was a pleasure meeting with you and the others in Berkeley. -

Very truly yours,

H. B. Rhodes

Harrison B. Rhodes
Technology Manager

HBR/rmm
Attachment

A 10307

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TEST PROTOCOL

OBJECTIVE

The objective of this test is to measure the airborne concentration of asbestos fibers generated during the removal of a non-resilient maintenance coating by sandblasting. The site selection, test operation, sample collection, and sample analysis will be carefully planned in advance so that meaningful results are obtained.

WORKING ARRANGEMENTS

The selection of the test site and provision for the sandblasting operator and equipment are the responsibility of the Union Carbide Corporation with the choices subject to approval by the Department of Health. It is intended that the Department of Health and Union Carbide will each have at least one qualified person at the site to work out a mutually acceptable sample collection strategy in accordance with the general guidelines under "Sample Collection Strategy".

Sample collection will be performed by the Department of Health. After collection is completed, a validated summary sheet of the collection data will be prepared with a copy for both participants. In order to expedite matters, the cassettes will be packaged and sent immediately by registered mail to:

Mr. Floyd Madsen, Director
OSHA Laboratory
390 Wakara Way
Salt Lake City, Utah 84108

The Department will send a confirming letter to Mr. Madsen requesting them to analyze the samples. He has been alerted and is expecting to receive 10-30 samples. When analysis is complete, the OSHA Laboratory will provide both participants with a copy of the results.

TEST SITE AND OPERATION CRITERIA

The following criteria apply to test site selection:

1. Reasonably representative of a substantial commercial use of the product.

2. Large enough to allow for several hours of dust generation.

3. Reasonably unambiguous definition of the composition of the asbestos-containing material being handled and an asbestos content in the upper part of the range of contents of interest.

4. Sandblasting will be done with regular commercial equipment and materials by a professional operator in a manner that is accepted commercial practice.

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SAMPLE COLLECTION STRATEGY

As noted previously, it is intended that the Cal/OSHA and Union Carbide representatives at the site work out the most appropriate sampling strategy with the following special provisions to be met:

1. Personal breathing zone samples will be taken on the operator and the helper (if present) that are subject to the highest exposures. In addition to samples collected during the actual operations, a reasonable number of samples will be collected before and after operation to permit an estimate of the 8-hour time-weighted average exposure.

2. Area samples upwind and downwind will be taken before, during and after the dust generation operation.

ADDED NOTE

The Union Carbide Corporation is participating in a national round-robin study of the NIOSH collection and analytical procedure. It has been agreed that we may have an observer wearing a pair of pumps moving in the immediate vicinity of the dust generation operation. Care will be taken that there is no interference with the test. These samples will be entered into the round-robin and since they will be counted by only the standard NIOSH procedure, the results are not relevant to the present tests.

SAMPLE ANALYSIS

All sample cassettes will be shipped unopened to the Federal OSHA Compliance Laboratory at Salt Lake City.

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