INDUSTRIAL HYGIENE FOUNDATION OF AMERICA, INC.

MELLON INSTITUTE, 4400 FIFTH AVENUE

PITTSBURGH 13, PA.

September 30, 1963

Mr. C. C. Ruddick
Pittsburgh Plate Glass Company
1 Gateway Center
Pittsburgh, Pennsylvania 15222

Dear Mr. Ruddick:

Enclosed are seven copies of our report on "Evaluation of The Asbestos Dust Hazard in Tyler, Texas Plant". If you have any questions or comments regarding this work, do not hesitate to call on us. Also, we have several extra copies if you have need of them.

A statement of charges covering these investigations will be submitted at a later date.

Sincerely yours,

Robert T. P. deTreville

Robert T. P. deTreville, M.D.
Managing Director

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Enclosures

INDUSTRIAL HYGIENE FOUNDATION OF AMERICA, INC.

MELLON INSTITUTE, 4400 FIFTH AVENUE

PITTSBURGH 13, PA.

September 30, 1963

Report on

EVALUATION OF THE ASBESTOS DUST HAZARD IN TYLER, TEXAS PLANT

of the

PITTSBURGH CORNING CORPORATION

July 8, August 6, 7, 1963

Field Investigation By:

Jacob Cholak
Lawrence J. Schafer
William J. Schreibeis

Samples Analyzed By:

The Kettering Laboratory
Cincinnati, Ohio

William J. Schreibeis, P.E.
Industrial Hygiene Engineer

Robert T. P. deTreville, M.D.
Managing Director

INTRODUCTION

On July 8, the plant of the Pittsburgh Corning Corporation, Tyler, Texas was visited by Messrs. Jacob Cholak and William J. Schreibeis in order to review the potential health hazards of handling asbestos during manufacture of asbestos pipe insulation. On August 6 and 7, 1963, sampling was conducted at the plant by Mr. Lawrence J. Schafer and an evaluation made of the airborne dust concentrations.

DISCUSSION OF RESULTS

In Table 1, the concentrations of particulate matter, when possible, are expressed both on a weight basis and as the number of particles present in one cubic foot of air. Samples collected with the high volume sampler and the electrostatic precipitator were suitable for gravimetric and other analysis while samples collected on membrane filters were suitable for dust counting only. The number of particles present in the air as total particulate matter and as asbestos fibers were determined. Any rod like particle with length definitely greater than width was considered as asbestos fiber. It may be seen that the per cent of fibers in the dust varied from a low of 29% to a high of 56%. The dust in the sawing area contained a slightly higher content of asbestos fibers than did the airborne dust in the production area. It will also be noted that more particles of dust and fibers of asbestos were present in the air near the scrap crushers

than, surprisingly, was the case for air in the sawing area. The values in Table 1 followed by an asterisk are estimated counts taken from the straight lines in Figure 1, fitted to the data by the method of least squares. It may be seen, that the dust counts and the mass concentrations are closely related. Figure 1 offers the plant a rather simple method for estimating the numbers of total particles and of the fibers of asbestos present per cubic foot of air from the mass weight data and volumes of air sampled.

Highest dust counts, at the threshold limit, were obtained in the case of samples collected at the scrap crusher. The highest concentration of dust occurred for the five-minute period that the three-unit dust collector in the saw area was being cleaned. The air at the take-off areas of the building machines was the least contaminated with dust.

It should be noted that the threshold limit for asbestos, (5 mppcf) is assumed to apply only to asbestos fibers while dust in the air of the plant will contain other particulates, including filler materials used in the process. Since there is some evidence that the most active particles are those fibers between 20 and 50 microns in length, the numbers of fibers present in various size categories were also determined. These data are given in Table 2. Data in Table 2 and the asbestos fiber counts in Table 1 were used to derive the data in Table 3. As may be seen from Table 2, the fibers in the air of the sawing area were generally shorter than were those in the process area.

In Table 4 are tabulated the per cent of the numbers of the fibers of asbestos or, more properly, bundles of fibers varying from 5 microns to less

than 1 micron in diameter. The fibers in the air of the sawing area appear to have slightly smaller diameters than was the case for fibers in the air of the process area.

The results of other analytical work performed on these samples are given in Table 5. As may be seen dusts or fibers removed from the air in the production and sawing areas did not contain any free crystalline silica. Two different samples of Dacolite contained variable small amounts of quartz and cristobalite. In view of the warning printed on each bag, the low concentrations of free silica in this material were rather surprising.

It would appear from the analysis of the samples that were collected intentionally only at those processes that appeared to be the principal producers of dust, that the number of asbestos fibers present in the air, with few exceptions, were well below the threshold limit of 5 mppcf. One significant exception was the brief period of time during which a collector system was being cleaned. During this period, excessive quantities of dust and fiber were being dispersed into the air for a period of about 5 minutes. It would appear, from an examination of the total numbers of particles and of fibers as well as observation of the operations, that the crusher and the sawing operation may at times produce large quantities of dust. However, the dust, because of its physical characteristics, appears to settle out of the air rapidly. Particles of particulates in samples collected at breathing level heights, were well below threshold limits, even though some operations were observed to produce what appeared visually to be large clouds of dust.

The type of asbestos used in the plant is "amosite" an iron-magnesium silicate. The specific gravity of this material is 3.45 as compared to 2.55 for chrysotile, the material more widely used in this country.

The fibers of chrysotile are also much smaller in diameter than are those of amosite, the minimum diameters being 0.5 micron and 0.03 micron respectively for amosite and chrysotile. Another factor in favor of the rapid settling of the fibers from the air of the plant is that the asbestos bundles are not given the drastic shredding as in the textile industry.

RECOMMENDATIONS

At no time during the survey was the air of the plant contaminated with dust to the point to affect visibility, and one could always see down the entire length of the rather long building in which the operations were being conducted. Nevertheless, our observation of the operations leads us to make the following recommendations:

1. There was an obvious need to institute a better housekeeping program, especially in the sawing area. Floors, equipment and other structures should be cleaned regularly and frequently according to a definite supervised schedule. Dry sweeping should be avoided and only vacuum cleaning equipment provided with suitable collectors should be used.

2. Hoods and ducts should be maintained in good working order and all breaks and leaks in connecting ducts, etc. should be repaired promptly.

3. The hoods and the exhaust system at the wheel cutter in the sawing room should be improved.

4. More space should be provided between the sawing equipment to reduce cross-contamination of the air with dust.

5. It is suggested that the crusher be fed by means of a short conveyor system in order to keep the operator clear of the cloud of dust produced when the machine is in operation.

6. Operators should be educated in respect to working habits which will reduce the dispersion of dusts. For example (a) carts of crushed material should be moved from the crusher only after the crusher has been turned off and a brief period has elapsed to permit dust to settle. (b) Work should be removed from the large slitter only after the exhaust system has cleared the dust from the interior of the piece being cut. A wait of only a few seconds would accomplish this. (c) Bag collectors should be opened only when the discharge end of the collector is closed.

Table 1 -- Concentrations of Particulate Matter in the Atmosphere at Various Locations in the Plant of the Pittsburgh Corning Corporation at Tyler, Texas

Sample No.	Date 1963	Time of Day	Description and Location of Sample	Method of Sample Collection	Weight of Dust Mg./M3	Number of Particles (mppcf) Total	Fibers	% Fibers in Total Dust
Process Areas								
7	8/6	11:30 am - 12:20 pm	General air near the scrap crusher.	High volume sampler	24.8	8.6*	4.8*	56
14	8/6	3:40 pm - 3:50 pm	Breathing zone at the scrap crusher while scrap was being crushed.	Electrostatic precipitator	21.2	7.5	4.2	56
20	8/7	12:00 N - 12:04 pm	Breathing zone at the scrap crusher while scrap was being crushed.	Millipore filter	--	3.9	1.0	26
9	8/6	1:15 pm - 1:45 pm	Breathing zone in the scrap and asbestos feed area.	Electrostatic precipitator	4.0	1.9	0.6	32
10	8/6	12:25 pm - 1:46 pm	General air in the scrap and asbestos feed area.	High volume sampler	16.9	6.2*	3.2*	52
17	6/7	10:38 am - 10:55 am	Breathing zone in the scrap and asbestos feed area.	Millipore filter	--	0.9	0.3	33
16	8/7	10:15 am - 10:35 am	Breathing zone in the building and take-off area.	Millipore filter	--	0.7	0.2	29
				AVERAGE:		4.2	2.0	40.5
Sawing Area								
1	8/6	8:38 am - 10:25 am	General air between the large edging saw and the large slitting saw.	High volume sampler	7.8	3.0*	1.2*	40
2	8/6	8:54 am to 9:02 am	Breathing zone at the large slitting saw while pieces 1 1/2" thick were being cut.	Electrostatic precipitator	7.4	1.6	0.8	50
3	8/6	9:18 am - 9:29 am	Breathing zone at the large edging saw while pieces 1 1/2" thick were being cut.	Electrostatic precipitator	4.1	1.2	0.5	42
4	8/6	9:57 am - 10:07 am	Breathing zone at the feed end of the large edging saw while pieces 1 1/2" thick were being cut.	Electrostatic precipitator	7.9	3.2	1.7	53
6	8/6	11:37 am - 11:52 am	Breathing zone at the large edging saw while heavy walled pieces were being cut.	Electrostatic precipitator	5.5	2.6	1.2	46

(Table continued)

Table 1 -- (Continued)

Sample No.	Date 1963	Time of Day	Description and Location of Sample	Method of Sample Collection	Weight of Dust Mg./M3	Number of Particles (mppcf) Total	Fibers	% Fibers in Total Dust
Sawing Area (continued)								
6	8/6	12:00 N - 12:10 pm	Breathing zone at the large slitting saw while heavy walled pieces were being cut.	Electrostatic precipitator	10.6	4.6*	1.8*	39
					21.*	7.5	4.2	56
5	8/6	10:10 am - 10:20 am	Breathing zone at the block saw.	Electrostatic precipitator	9.1	5.6	2.1	38
11	8/6	2:18 pm - 2:30 pm	Breathing zone at the wheel cutters while blocks were being cut.	Electrostatic precipitator	16.8	5.9*	3.3	56
12	8/6	2:32 pm - 2:45 pm	Breathing zone at the wheel cutters while blocks were being cut.	Millipore filter	--	3.8*	1.4	37
13	8/6	3:15 pm - 3:20 pm	Breathing zone while cleaning the 3-unit dust collector in the saw area (down-stream of dust cloud).	Electrostatic precipitator	195.0	66.0*	29.6*	45
					--	0.9	0.3	33
19	8/7	11:40 am - 12:04 pm	General air near the 3-unit dust collector in the saw area.	Electrostatic precipitator	3.5	1.5	0.7	47
			AVERAGE FOR SAMPLES LESS NO. 13:			3.37	1.47	45
Miscellaneous								
15	8/6	10:05 am - 10:55 am	General air in the asbestos storage area.	Electrostatic precipitator	2.9	0.9	0.3	33
18	8/6	11:10 am - 11:55 am	General air in center of the product storage area.	Millipore filter	--	<0.1*	<0.1*	

* Values are taken from the curves fitted to data in Figure 1.

Table 2 -- The Per Cent of the Total Number of Asbestos Fibers Occurring in Various Ranges of Length

Sample No.	Date 1963	Time of Day	Description and Location of Sample	mppcf Asbestos Fibers	Lengths of Fibers in Microns ≤100	≤50	≤40	≤30	≤20	≤10	≤5	≤1
Process Areas												
14	8/6	3:40 pm - 3:50 pm	Breathing zone at the scrap crusher while scrap was being crushed.	4.2	100	94.2	94.2	85.1	74.6	55.1	21.3	0
20	8/7	12:00 N - 12:04 pm	Breathing zone at the scrap crusher while scrap was being crushed.	1.0	100	98.2	96.4	94.6	81.9	51.9	11.1	0
9	8/6	1:15 pm - 1:45 pm	Breathing zone in the scrap and asbestos feed area.	0.6	97.7	90.3	87.1	77.5	65.7	44.8	18.4	0
17	8/7	10:38 am - 10:55 am	Breathing zone in the scrap and asbestos feed area.	0.3	100	97.3	97.3	97.3	94.6	75.5	31.0	0
16	8/7	10:15 am - 10:35 am	Breathing zone in the building and take-off area.	0.2	94.1	88.9	86.4	83.9	74.6	53.4	17.0	0
Sawing Area												
2	8/6	8:54 am - 9:02 am	Breathing zone at the large slitting saw while pieces 1 1/2" thick were being cut.	0.8	96.9	89.4	83.8	70.1	60.1	40.8	4.1	0
3	8/6	9:18 am -	Breathing zone at the large edging saw while pieces 1 1/2" thick were being cut.	0.5	100	92.5	90.5	85.5	78.1	43.3	6.4	0
4	8/6	9:57 am - 10:07 am	Breathing zone at the feed end of the large edging saw while pieces 1 1/2" thick were being cut.	1.7	98.5	92.5	89.5	79.5	69.5	27.0	4.0	0
6	8/6	11:37 am - 11:52 am	Breathing zone at the large edging saw while heavy walled pieces were being cut.	1.2	98.0	94.0	91.5	89.0	84.5	60.9	19.2	0
8	8/6	12:00 N -	Breathing zone at the large slitting saw while heavy walled pieces were being cut.	1.8	99.5	99.5	98.0	96.0	89.7	79.5	39.2	0
5	8/6	10:10 am - 10:20 am	Breathing zone at the block saw.	2.1	99.0	94.5	89.1	80.7	73.8	43.7	4.1	0
11	8/6	2:18 pm - 2:30 pm	Breathing zone at the wheel cutters while blocks were being cut.	3.3	99.0	98.0	97.5	97.5	94.0	77.8	25.3	0

(Table continued)

Table 2 -- (Continued)

Sample No.	Date 1963	Time of Day	Description and Location of Sample	mppcf Asbestos Fibers	Percentage of Fibers in Microns Lengths of Fibers In Microns							
					<100	<50	<40	<30	<20	<10	<5	<0
Sawing Area (continued)												
12	8/6	2:32 pm - 2:45 pm	Breathing zone at the wheel cutters while blocks were being cut.	1.4	100	96.6	96.6	96.1	91.8	78.0	40.8	0
13	8/6	3:15 pm - 3:20 pm	Breathing zone while cleaning the 3-unit dust collector in the saw area (downstream of dust cloud).	29.6	100	99.0	98.0	96.1	89.9	76.0	29.2	0
19	8/7	11:40 am - 12:04 pm	General air near the 3-unit dust collector in the saw area	0.7	100	96.1	92.2	89.0	71.5	39.7	10.5	0
Miscellaneous												
15	8/7	10:05 am - 10:55 am	General air in the asbestos storage area.	0.3	99.2	90.9	85.3	76.2	67.9	41.5	8.5	0
18	8/7	11:10 am - 11:55 am	General air in center of the product storage area.	0.1	Too Few Fibers							

Table 3 - The Numbers of Asbestos Fibers (mppcf) Present in the Air According to the Range of the Lengths of the Fibers

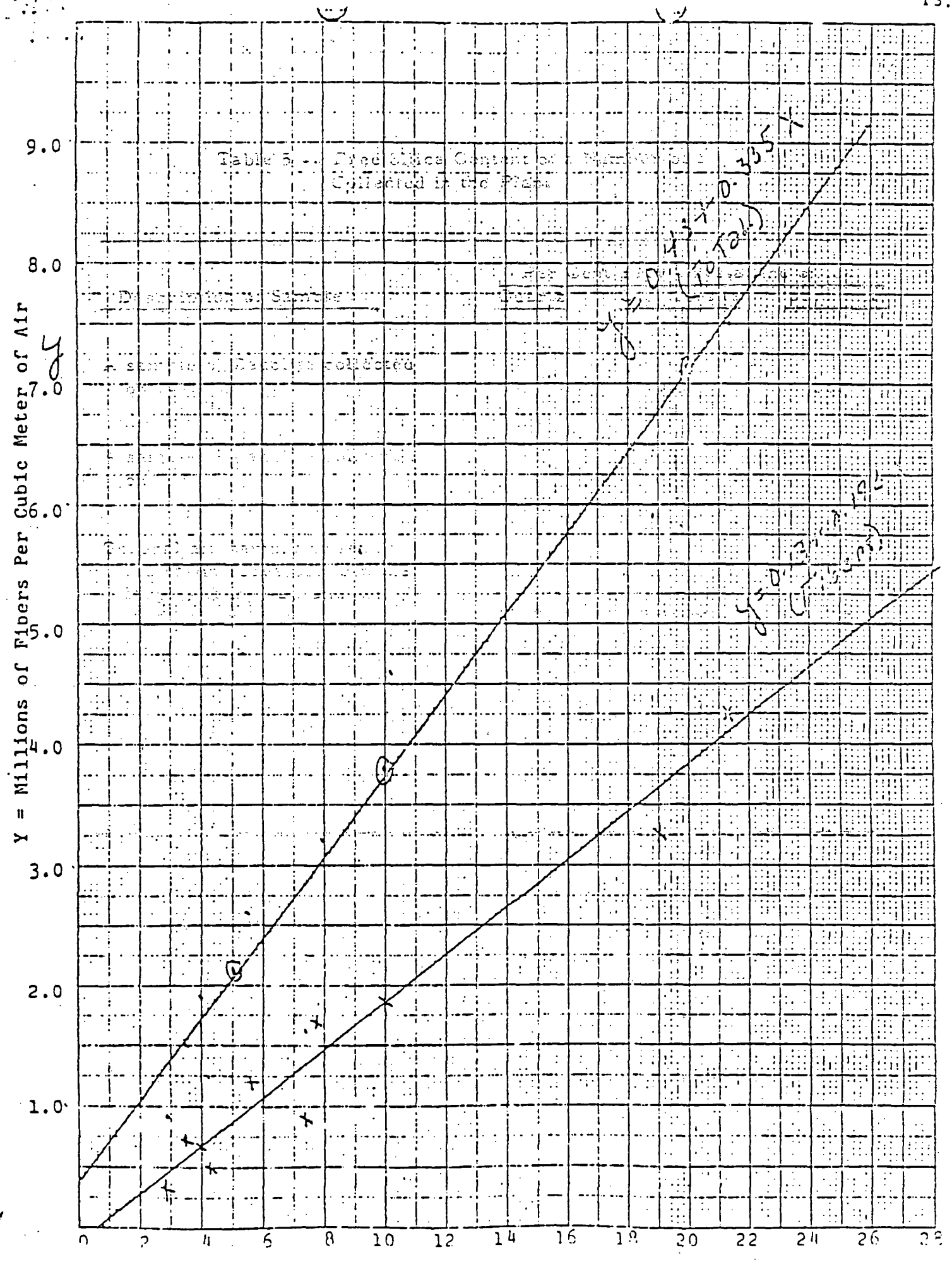
Sample No.	Millions of Fibers Per Cubic Foot of Air	
	5 - 50 Microns in Length	10 - 50 Microns in Length
2	0.68	0.39
3	0.43	0.25
4	1.50	1.10
5	1.90	1.07
6	0.90	0.40
8	1.09	0.36
9	0.43	0.27
11	2.40	0.67
12	0.78	0.26
13	20.70	6.80
14	3.06	1.64
15	0.25	0.15
16	0.14	0.07
17	0.20	0.07
19	0.60	0.40
20	0.87	0.46

Table 4 -- The Per Cent of the Total Number of Asbestos Fibers with Diameters Less Than Those Stated

Sample No.	Date 1963	Time of Day	Description and Location of Sample	mppcf Asbestos Fibers	Diameters of Asbestos Fibers (Microns)				
					< 5	< 4	< 3	< 2	< 1
Process Areas									
14	8/6	3:40 pm - 3:50 pm	Breathing zone at the scrap crusher while scrap was being crushed.	4.2	100	99.1	96.5	65.6	11.3
20	8/7	12:00 N - 12:04 pm	Breathing zone at the scrap crusher while scrap was being crushed.	1.0	100	100	99.1	85.6	13.4
9	8/6	1:15 pm - 1:45 pm	Breathing zone in the scrap and asbestos feed area.	0.6	100	98.5	89.8	68.8	7.3
17	8/7	10:38 am - 10:55 am	Breathing zone in the scrap and asbestos feed area.	0.3	99.1	97.4	86.1	71.1	27.9
16	8/7	10:15 am - 10:35 am	Breathing zone in the building and take-off area.	0.2	100	97.5	95.8	72.1	21.3
Sawing Area									
2	8/6	8:54 am - 9:02 am	Breathing zone at the large slitting saw while pieces of 1 1/2" thick were being cut.	0.8	100	100	91.3	60.9	21.9
3	8/6	9:18 am - 9:29 am	Breathing zone at the large edging saw while pieces of 1 1/2" thick were being cut.	0.5	98.2	94.6	91.8	66.3	28.3
4	8/6	9:57 am - 10:07 am	Breathing zone at the end of the large edging saw while pieces 1 1/2" thick were being cut.	1.7	99.0	97.0	88.5	64.0	18.7
6	8/6	11:37 am - 11:52 am	Breathing zone at the large edging saw while heavy walled pieces were being cut.	1.2	98.0	96.0	86.1	58.4	21.8
8	8/6	12:00 N - 12:10 pm	Breathing zone at the large slitting saw while heavy walled pieces were being cut.	1.8	100	97.4	92.9	75.5	28.5
5	8/6	10:10 am - 10:20 am	Breathing zone at the block saw.	2.1	100	98.7	96.0	65.1	8.7
11	8/6	2:18 pm - 2:30 pm	Breathing zone at the wheel cutters while blocks were being cut.	3.3	100	98.6	93.0	71.5	22.9
12	8/6	2:32 pm - 2:45 pm	Breathing zone at the wheel cutters while blocks were being cut.	1.4	99.1	97.4	93.0	70.4	21.8
13	8/6	3:15 pm - 3:20 pm	Breathing zone while cleaning the 3-unit dust collector in the saw area (downstream of dust cloud).	29.6	98.0	95.0	87.2	70.7	15.4
19	8/7	11:40 am - 12:04 pm	General air near the 3-unit dust collector in saw area.	0.7	100	99.1	92.1	66.7	14.2
Miscellaneous									
15	8/7	10:05 am - 10:55 am	General air in the asbestos storage area.	0.3	100	99.1	98.2	81.2	10.5

Table 5 - Free Silica Content of a Number of Samples Collected in the Plant

Description of Sample	Per Cent Free Crystalline Silica		
	Quartz	Cristobalite	Tridymite
A sample of Dacolite collected on 7-10-63	3.0	2.5	Absent
A sample of Dacolite collected on 8-5-63	1.2	<2.0	Absent
General air sample collected in the sawing area between the large slitting saw and the large edging saw.	<2.0	Absent	Absent
General air sample collected 5 feet from the scrap crusher.	<2.0	Absent	Absent
General air sample collected in the feed area.	<2.0	Absent	Absent


Y = Millions of Fibers Per Cubic Meter of Air
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
2
4
6
8
10
12
14
16
18
20
22
24
26