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AB-306

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ABEX CORPORATION
AN EVALUATION OF VARIOUS FACTORS
INFLUENCING AIRBORNE ASBESTOS
CONCENTRATIONS
FRICTION PRODUCTS GROUP - WINCHESTER
SEPTEMBER 30, 1974 - OCTOBER 4, 1974

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November 19, 1974

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PURPOSE

The purpose of this visit was to evaluate some of the factors associated with the manufacturing of various friction products in order to determine the effects of these factors upon the airborne asbestos concentrations associated with the processes.

SUMMARY

For the purposes of this study, the scope of this evaluation was essentially confined to three general locations: the book preformers, the block preformers, and the strip roll machines. Samples were taken in other locations, but the majority of the sampling occurred at these three locations. The variables that were considered during this study were: the type of mix used and the fiber length of the asbestos associated with the specific mix, the height of the employees, the working habits of the employees (clean or dirty), and the effect of additional experimental enclosures upon the airborne concentrations of asbestos.

The results of this study indicate that the type of mix used, and the degree of enclosure significantly affects the airborne asbestos concentrations generated at the various preforming operations. The factors of employee height and the employee working habits were secondary factors, and by themselves did not significantly affect the airborne asbestos concentrations.

Each of the variables investigated during this study will be summarily discussed in the following sections of this report. Various comparative appendices and a sketch are also attached.

DISCUSSION

Mix type: Using the comparative data gathered from the various mix types (see Appendix #2), there are two trends that emerge. First, the wet mixes generate far less airborne asbestos at various preforming operations than the dry mixes. Second, the mixes containing more of the longer asbestos fibers in their composition are associated with higher airborne asbestos concentrations. The mixes containing the longer asbestos fibers are generally lighter and fluffier than the mixes containing more of the shorter asbestos fibers. The lightness of the mix adds to the propensity for the airborne distribution of the asbestos fibers.

Regarding wet mixes and the amount of airborne asbestos that they generate, reference is made to Appendix #2, samples #14 & #15 and #20 & #21. These four samples were taken at two similar strip roll machines (#3 & #4). These two machines were sampled in the morning and in the afternoon on the same day. The only variable was that the operators switched machines in the afternoon. Both operators selected were about the same height, and both work very cleanly. The resulting airborne asbestos concentrations were as follows: strip roll machine #3 - (sample #14 0.50 fibers $>5\mu$/ml), strip roll machine #4 - (sample #15 0.43 fibers $>5\mu$/ml), strip roll machine #3 - (sample #20 0.29 fibers $>5\mu$/ml), and strip roll machine #4 - (sample #21 0.18 fibers $>5\mu$/ml). The average of these four samples is 0.35 fibers $>5\mu$/ml which is very low especially when there is no local exhaust ventilation provided at these machines. The wet mixes, by binding the asbestos fibers with the other components in the mix, generate very little airborne asbestos in the preforming stages.

The length of the asbestos fibers used in the various mixes is also a significant factor related to airborne asbestos concentrations. Referring to Appendix #2 again, most of the mixes studied contained approximately 50% of the long fibered asbestos and 50% of the short fibered asbestos. The average fiber count computed for these mix types was about 1.5 fibers $>5\mu$/ml. This average figure can be compared with samples containing only the longer fibered asbestos. Samples #3 and #11 were such samples containing 100% of the longer asbestos fibers. The mix used for these two samples was 80 mix used in the block preform department. The results for these two samples were - (sample #3 4.10 fibers $>5\mu$/ml) and (sample #11 3.59 fibers $>5\mu$/ml). These results are approximately 2½ times the average count associated with mixes containing equal amounts of the short and long fibered asbestos.

Another comparative observation made was between the 80 mix results versus results taken at the same machine with the same operator but with another mix (mix 551CSC). This was sample #16 and the resulting concentration was 1.24 fibers

$>5\mu/ml$ almost 3 times less than the airborne concentration that was generated when 80 mix was being used at the machine.

These results strongly indicate that the dry fluffier asbestos mixes containing the longer fibers will generate more airborne asbestos than mixes containing asbestos of shorter fiber length. Perhaps the shorter asbestos fibers are more effectively bound up in the mix than the longer fibers. In any event, substitution of the longer fibered asbestos by the shorter fibered asbestos should be investigated.

Employee Height: Another of the variables studied was the relationship between the height of the employees and the airborne asbestos levels. Attention is called to Appendix #3 which gives comparative data on employee height and Appendix #4 which gives data about the book preform area. For the purposes of determining the effect of the operator height on airborne asbestos concentrations, a total of 4 samples were taken. The two operators selected were 6 ft. tall and 5 ft. 6 in. short, respectively, and they changed positions so that each worked on all four machines for equal periods of the sampling day. All of the other conditions, mix type, etc., remained the same. Samples #1 & #2 and samples #12 & #13 represent this sampling situation.

Operator #3C-4418 (6 ft. tall) worked on machines #9 and #13 (sample #1) in the morning and then machines #15 and #16 (sample #12 in the afternoon. His levels of exposure were identical: (sample #1-1.46 fibers $>5\mu/ml$), (sample #12-1.46 fibers $>5\mu/ml$). His average exposure was 1.46 fibers $>5\mu/ml$.

Operator #3C-730 worked on machines #15 and #16 (sample #2) in the morning, and then on machines #9 and #13 (sample #13) in the afternoon. His levels of exposure were: (sample #2-1.75 fibers $>5\mu/ml$), (sample #13-1.54 fibers $>5\mu/ml$). His average exposure was 1.64 fibers $>5\mu/ml$.

These results indicate that the operator height is not an important factor in regards to employee exposure to airborne asbestos.

Employee Working Habits: The type of working habits studied was associated with the degree of care an employee took when working with the mixes and how much dirt was being generated during his normal working activities. Two arbitrary parameters, clean and dirty, were selected. Clean meant that the operator did not generate large amounts of dust as he worked and that he kept himself relatively clean for the operation involved. Dirty meant that the operator generated more dust than average and that his person was pretty dirty too. Reference is made to Appendix #3 which compares the operators' working habits.

The average concentration for clean operations was 1.53 fibers > 5μ/ml (for 12 samples). The average concentration for dirty operations was 1.61 fibers > 5μ/ml (for 7 samples). During this study the operators would work on the same machines to keep the number of variables to a minimum. The average concentrations for the clean and dirty operators were based on dry mixes containing approximately 50% long and 50% short asbestos fibers. Samples involving 80 mix and wet mixes were not considered because of the effects that those variables had upon the concentrations. The results of these tests indicate that the differences between dirty and clean operators in their exposures were not significant under similar working conditions and with the same mixes.

<u>Experimental Enclosure</u>: Four machines (#9, #13, #12, and #16) in the book preform department were chosen in order to see the effects of additional enclosure upon airborne asbestos concentrations. The attached sketch #1 gives a rough indication as to what the additional enclosure consisted of. Appendix #4, samples #25 & #26 and #27 & #28 give the results of these tests. Samples #25 & #26 were taken at machines #9 & #13 and #12 & #16 respectively, before the additional enclosure was attached. Samples #27 & #28 were taken at the same machines respectively after the additional enclosure was attached.

The sample results are as follows:

a. sample #25 - 1.75 fibers > 5μ/ml (no additional enclosure
b. sample #27 - 0.84 fibers > 5μ/ml (with additional enclosure).
c. sample #26 - 2.31 fibers > 5μ/ml (no additional enclosure).
d. sample #28 - 1.31 fibers > 5μ/ml (with additional enclosure).

These test results clearly indicate that the exposure levels were reduced in half as a result of the additional enclosure.

Conclusions: As a result of this study the following recommendations are made:

1. At the book preform, block preform, disc preform and other areas where high airborne asbestos concentrations have been detected, enclose the operations as much as is practical. Sheet metal enclosures are preferable, but canvas or lead vinyl curtains can be effectively used too.

2. Where practical, substitute wet mixes for dry mixes in the preforming stages.

3. Where practical, substitute mixes containing asbestos fibers of shorter length for mixes containing asbestos fibers of longer length.

During the visit, I received excellent cooperation from Jeff Nicholson, Lloyd Broadstreet, Roger Dillon, Charlie Mallory, and Bob Brown. I thank them all for their assistance and courtesies.

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11/6/74

FRICTION PRODUCTS GROUP
WINCHESTER, VIRGINIA
APPENDIX #1

FIELD SAMPLE #1

Fiber count>5µ/ml-1.46
Lab No. - 1839
Loc.-Book Preform #13 (new exhaust design) & Book Preform #9 (old exhaust design)
Med. Study #3C-4418
Date - 10-1-74
Time: 8:55am-10:42am
Sampling rate in liters per min. - 1.9591
Air vol.(liters)-209.6
Avge count/field-2.00
Mix used #13-551D-333
Mix used #9-551D-333
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Work habits - clean
Worker height - 6 ft.
Ventilation (fpm) #13
a. at weigh scale slot face - 3,500
b. at front hood press face - 600
c. at side hood face- 300
Ventilation(fpm) #9
a. at top hood face - 1,200

FIELD SAMPLE #2

Fiber count>5µ/ml-1.75
Lab No. - 1840
Loc.-Book Preform #15 & Book Preform #16 (both are old exhaust design)
Med. Study #3C-730
Date - 10-1-74
Time: 9:00am-10:54am
Sampling rate in liters per min. - 1.9823
Air vol.(liters)-226.0
Avge.count/field-2.58
Mix used #15-133-9
Mix used #16-551D-333
Percent long fibers in mix 133-9 - 26%
Percent short fibers in mix 133-9 - 74%
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Work habits - dirty
Worker height - 5'6"
Ventilation (fpm)#15
a. at top hood face 1,300
Ventilation (fpm) #16
a. at top hood face 1,200

FIELD SAMPLE #3

Fiber count>5µ/ml-
Lab No. - 1841
Loc.-Book Preform
Med. Study #3C-405
Date - 10-1-74
Time: 9:21am-10:48
Sampling rate in l per min.-1.9591
Air vol.(liters)-1
Avge. count/field-
Mix used #5 - 80 m
Percent long fiber 80 mix - 100%
Percent short fibe 80 mix - 0%
Work habits - dirt
Worker height - 6
Ventilation (fpm)
a. at front hood f 1,500 (left)
Double cavity mach

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FIELD SAMPLE #4
Fiber count $>5\mu$/ml - 1.73
Lab No. - 1842
Loc.-Block preform #17
Medical Study #3C-735
Date: 10-1-74
Time: 9:27am-10:45am
Sampling rate in liters per min.-1.9359
Air vol.(liters)-151.0
Avge.count/field-1.71
Mix used #17-551-C
Percent long fibers in mix 551-C - 56%
Percent short fibers in mix 551-C - 44%
Work habits - clean
Worker height-6'1"
Ventilation (fpm)
a. at front hood face- 1,600
Single cavity machine

FIELD SAMPLE #5
Fiber count $>5\mu$/ml - 1.20
Lab No. - 1843
Loc. - Disc brake preform #1
Med. Study #3C-424
Date - 10-1-74
Time: 9:34am-11:31am
Sampling rate in liters per min.-1.9823
Air vol.(liters)-232.0
Avge.count/field-1.82
Mix used -672-124
Work habits - clean
Worker height - 5'8"
Ventilation (fpm)
a. left side press area 1,200
b. right side press area 1,200

FIELD SAMPLE #6
Fiber count $>5\mu$/ml-
Lab No. - 1844
Loc. - Blank
Date - 10-1-74

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WINCHESTER, VIRGINIA
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FIELD SAMPLE #7
Fiber count>5μ/ml-2.99
Lab No. - 1845
Loc.-#2 line Blok O.D. grinder #SKA-442 #3
Med. Study #3C-2095
Date - 10-1-74
Time: 9:39am-11:34am
Sampling rate in liters per min.-1.9591
Air vol. (liters)-225.3
Avge.count/field-4.39
Work habits - clean
Worker height-6'1"
Ventilation (fpm)
a. at wheel hood face 1,800

FIELD SAMPLE #8
Fiber count>5μ/ml-0.60
Lab. No. - 1846
Loc.-Set on a post about 6 ft. from Field Sample #7
Date - 10-1-74
Time: 9:41am-11:37am
Sampling rate in liters per min.-1.9591
Air vol.(liters)-227.3
Avge.count/field-0.90

FIELD SAMPLE #9
Fiber count>5μ/ml-1
Lab No. - 1847
Loc.-Mill groove AB 567
Med.Study #3C-727
Date - 10-1-74
Time: 9:43am-11:47a
Sampling rate in li
per min. -1.9823
Air vol.(liters)-24
Avge.count/field-1.
Work habits - clean
Worker height - 6 f
Ventilation (fpm)
a. at wheel hood fa
1,800

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APPENDIX #1

FIELD SAMPLE #10
Fiber count>5μ/ml-1.68
Lab.No. - 1848
Loc.-Block preform #10
Med. Study #3C-735
Date - 10-1-74
Time: 11:39am-1:55pm
Sampling rate in liters per min.-1.9319
Air vol.(liters)263.3
Avge.count/field-2.89
Mix used - 551D
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Work habits - clean
Worker height - 6'1"
Ventilation (fpm)#10
a. at front hood face
1,600
Single cavity machine

FIELD SAMPLE #11
Fiber count>5μ/ml-3.59
Lab. No. - 1849
Loc.-Block preform #5
Med. Study #3C-4059
Date - 10-1-74
Time:11:41am-1:57pm
Sampling rate in liters per. min.-1.9591
Air vol.(liters) 266.4
Avge.count/field-6.30
Mix used - 80 mix
Percent long fibers in 80 mix - 100%
Percent short fibers in 80 mix - 0%
Work habits - dirty
Worker height - 6 ft.
Ventilation (fpm) #5
a. at front hood face
1,500
Double cavity machine

FIELD SAMPLE #12
Fiber count>5μ/ml-
Lab. No. - 1850
Loc.-Book preform
Book preform #16 (
are old exhaust de
Medical Study #3C-
Date - 10-1-74
Time: 11:43am-2:01
Sampling rate in l
per min.-1.9591
Air vol.(liters)-2
Avge.count/field-2
Mix used #15 - 133
Mix used #16 - 551
Percent long fiber
mix #133-1 - 26%
Percent short fibe
mix 551D-333 - 74%
Percent long fiber
mix 551D-333 - 55%
Percent short fibe
mix 551D-333 - 45%
Work habits - clea
Worker height - 6
Ventilation (fpm)#
a. at top hood fac
1,300
Ventilation (fpm)
a. at top hood fac
1,200

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WINCHESTER, VIRGINIA
APPENDIX #1

FIELD SAMPLE #13

Fiber count>5μ/ml - 1.54
Lab No. - 1851
Loc.-Book preform #13 (new exhaust design) & Book preform #9 (old exhaust design)
Med. Study #3C-730
Date - 10-1-74
Time: 11:45am-2:00pm
Sampling rate in liters per min.-1.9591
Air vol.(liters) 264.5
Avge.count/field-2.66
Mix used #13-551D-333
Mix used #9-551D-333
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Work habits - dirty
Worker height - 5'6"
Ventilation (fpm) #13
a. at weight scale slot face - 3,500
b. at front hood press face - 600
c. at side hood face- 300
Ventilation (fpm) #9
a. at top hood face 1,200

FIELD SAMPLE #14

Fiber count>5μ/ml-0.50
Lab. No. - 1852
Loc. - Roll Machine #3
Med. Study #3C-767
Date - 10-2-74
Time: 7:48am - 11:07am
Sampling rate in liters per min.-1.9823
Air vol.(liters) 394.5
Avge.count/field-1.28
Mix used - 435-7
Wet mix
Work habits-clean
Worker height-5'9"
Ventilation - None

FIELD SAMPLE #15

Fiber count>5μ/ml -
Lab No. - 1853
Loc.-Roll Machine #4
Med. Study #3C-4473
Date - 10-2-74
Time: 7:52am-11:04am
Sampling rate in lit
per min.-1.9591
Air vol(liters) 376.
Avge.count/field-1.0
Mix used - 734-161
Wet mix
Work habits - clean
Worker height - 5'10
Ventilation - None

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WINCHESTER, VIRGINIA
APPENDIX #1

FIELD SAMPLE #16

Fiber count>5μ/ml-1.24
Lab No. - 1854
Loc.-Block preform #5
Med. Study #3C-4059
Date - 10-2-74
Time: 8:02am-10:54am
Sampling rate in liters per min.-1.9591
Air vol.(liters)-337.0
Avge.count/field 2.76
Mix used - 551CSC
Percent long fibers in mix 551CSC - 56%
Percent short fibers in mix 551CSC - 44%
Work habits - dirty
Worker height - 6 ft.
Ventilation (fpm) #5
a. at front hood face 1,500 (left)
b. at front hood face 600 (right)
Double cavity machine

FIELD SAMPLE #17

Fiber count>5μ/ml-0.97
Lab No. - 1855
Loc.-Block preform #17
Med. Study #3C-735
Date - 10-2-74
Time: 8:06am-10:59am
Sampling rate in liters per min.-1.9823
Air vol.(liters) 342.9
Avge.count/field 2.15
Mix used - 693-555
Percent long fibers in min - 57%
Percent short fibers in mix - 43%
Work habits - clean
Worker height - 6'1"
Ventilation (fpm) #17
a. at front hood face 1,400
Single cavity machine

FIELD SAMPLE #18

Fiber count>5μ/ml-0.
Lab No. - 1856
Loc.-Block preform
Med. Study #3C-4059
Date - 10-2-74
Time: 10:54am-1:08
Sampling rate in li
per min.-1.9591
Air vol.(liters) 26
Avge.count/field 1.
Mix used - 693-555
Percent long fibers
mix - 57%
Percent short fiber
mix - 43%
Work habits - dirty
Worker height - 6 f
Ventilation (fpm) #1
a. at frot hood fac
1,400
Single cavity machi

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WINCHESTER, VIRGINIA
APPENDIX #1

FIELD SAMPLE #19

Fiber count>5μ/ml-1.15
Lab No. - 1857
Loc.-Block preform #5
Med.Study #3C-735
Date - 10-2-74
Time: 11:02am-1:10pm
Sampling rate in liters per min.-1.9823
Air vol.(liters)-253.7
Avge.count/field-1.91
Mix used - 551CSC
Percent long fibers in mix 551CSC - 56%
Percent short fibers in mix 551CSC - 44%
Work habits - clean
Worker height - 6'1"
Ventilation (fpm) #5
a. at front hood face 1,500 (left
b. at front hood face 600 (right)
Double cavity machine

FIELD SAMPLE #20

Fiber count>5μ/ml-0.29
Lab. No. - 1858
Loc.-Roll machine #3
Med. Study #3C-4473
Date - 10-2-74
Time: 11:06am-1:13pm
Sampling rate in liters per min.-1.9823
Air vol.(liters)-251.8
Avge.count/field-0.48
Mix used - Wet mix 435-7
Percent long fibers in mix 435-7 - 0% (?)
Percent short fibers in mix 435-7 - 100% (?)
Worker habits - clean
Worker height - 5'10"
Ventilation - None

FIELD SAMPLE #21

Fiber count>5μ/ml-
Lab No. - 1859
Loc.-Roll machine
Med. Study #3c-76
Date - 10-2-74
Time: 11:08am-1:1
sampling rate in
per min.-1.9591
Air vol.(liters)-
Avge.count/field-
Mix used - Wet mi
Percent long fibe
mix 734-161 - 0%
Percent short fib
mix 734-161 - 100
Worker habits - c
Worker height - 5
Ventilation - Non

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APPENDIX #1

FIELD SAMPLE #22

Fiber count>5µ/ml-0.00
Lab No. - 1860
Loc. - Blank
Date - 10-2-74

FIELD SAMPLE #23

Fiber count>5µ/ml-2.02
Lab No. - 1861
Loc.-Discpreform #3
Med. Study #3C-014
Date - 10-3-74
Time: 8:28am-10:50am
Sampling rate in liters per min.-1.9823
Air vol.(liters)-281.5
Avge.count/field-3.75
Mix used - 238
Worker habits - clean
Worker height - 5'10"
Ventilation (fpm) #3

a. lower left side small hood at face, 2,700
b. middle left side small hood at face 2,800
c. upper left side hopper exhaust at face - 600
d. lower right side small hood at face 2,800
e. middle right side small hood at face 2,500
f. upper right side hopper exhaust at face - 500

FIELD SAMPLE #24

Fiber count>5µ/ml-
Lab. No. - 1862
Loc.-Block preform
Med. Study #3C-168
Date - 10-3-74
Time: 8:38am-10:48
Sampling rate in l
per min. - 1.9591
Air vol.(liters)-2
Avge.count/field-3
Mix used - 551-DSC
Percent long fiber
mix 551-DSC - 55%
Percent short fibe
mix 551-DSC - 45%
Work habits - dirt
Worker height - 6
Double cavity mach

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WINCHESTER, VIRGINIA
APPENDIX #1

FIELD SAMPLE #25

Fiber count>5µ/ml-1.75
Lab No. - 1863
Loc.-Book preform #13 (new exhaust design) & Book preform #9 (old exhaust design)
Med. Study #3C-4418
Date - 10-3-74
Time: 9:02am-10:52am
Sampling rate in liters per min. - 1.9823
Air vol.(liters)-218.1
Avge.count/field-2.50
Mix used #13-551D-333
Mix used #9 - 551D-333
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Work habits - clean
Worker height - 6 ft.
Ventilation (fpm) #13
a. at weigh scale slot face - 4,000
b. at front hood press face - 600
c. at side hood face - 300
d. at rear hood face- 600
Ventilation (fpm) #9
a. at weigh scale slot face - 4,000
b. at top front hood face - 2,100
Sample taken without experimental enclosure in position.

FIELD SAMPLE #26

Fiber count>5µ/ml-2.31
Lab No. - 1864
Loc.-Book preform #12 & Book preform #16 (both are old exhaust designs)
Med. Study #3C-730
Date - 10-3-74
Time: 9:06am-10:53am
Sampling rate in liters per min.-1.9591
Air vol.(liters)-209.6
Avge.count/field-3.16
Mix used #12-551D-333
Mix used #16-47E
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Percent long fibers in mix 47E - 100% (?)
Percent short fibers in mix 47E - 0% (?)
Work habits - dirty
Worker height - 5'6"
Ventilation (fpm) #12
a. at weigh scale 5,300
b. at top hood face 2,200
Ventilation (fpm) #16
a. at weigh scale 4,200
b. at top hood face - 2,300
Sample taken without experimental enclosure in position.

FIELD SAMPLE #27

Fiber count>5µ/ml-
Lab. No. - 1865
Loc.-Book preform
(new exhaust desig
Book preform #9 (c
exhaust design)
Med. Study #3C-441
Date - 10-3-74
Time: 12:12pm-2:02
Sampling rate in l
per min.-1.9591
Air vol.(liters)-2
Avge.count/field-1
Mix used #13-551D-
Mix used #9 - 551I
Percent long fiber
mix 551D-333 - 55%
Percent short fibe
mix 551D-333 - 45%
Work habits - clea
Worker height - 6
Ventilation (fpm)
a. at weigh scale
face - 4,000
b. at front hood p
face - 600
c. at side hood fa
d. at rear hood fa
Ventilation (fpm)
a. at weigh scale
face - 4,000
b. at top front hc
face - 2,100
Sample taken with
experimental enclc
in position.

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WINCHESTER, VIRGINIA
APPENDIX #1

FIELD SAMPLE #28

Fiber count>5µ/ml-1.31
Lab No. - 1866
Loc.-Book preform #2 & Book preform #16 (both are old exhaust designs)
Med. Study #3C-730
Date - 10-3-74
Time: 12:14pm-2:03pm
Sampling rate in liters per min.-1.9359
Air Vol.(liters)-211.0
Average count/field-1.79
Mix used #12-551D-333
Mix used #16 - 47E
Percent long fibers in mix 551D-333 - 55%
Percent short fibers in mix 551D-333 - 45%
Percent long fibers in mix 47E - 100% (?)
Percent short fibers in mix 47E-0% (?)
Work habits - Dirty
Worker height - 5'6"
Ventilation (fpm) #12
a. at weigh scale 5,300
b. at top hood face 2,200
Ventilation (fpm) #16
a. at weigh scale 4,200
b. at top hood face - 2,300
Sample taken with the experimental enclosure in position.

FIELD SAMPLE #29

Fiber count>5µ/ml-0.00
Lab No. - 1867
Loc. - Blank
Date - 10-3-74

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APPENDIX #2

Sample No. Field	Lab.	Mix Used	% Long Fibers in Mix	% Short Fibers in Mix	Fiber Count > 5µ/ml
1	1839	#551D-333	55%	45%	1.46
2	1840	#133-9 #551D-333	26%) 55%) 40% Avge.	74%) 45%) 60% Avge.	1.75
3	1841	#80 mix	100%	0%	4.10
4	1842	#551C	56%	44%	1.73
5	1843	#672-124	–	–	1.20
6	1844	Blank	–	–	0.00
7	1845	–	–	–	2.99
8	1846	–	–	–	0.60
9	1847	–	–	–	1.11
10	1848	#551D-333	55%	45%	1.68
11	1849	#80 mix	100%	0%	3.59
12	1850	#133-9 #551D-333	26%) 55%) 40% Avge.	74%) 45% 60% Avge.	1.46
13	1851	#551D-333	55%	45%	1.54
14	1852	#435-7	Wet mix	Wet mix	0.50
15	1853	#734-161	Wet mix	Wet mix	0.43
16	1854	#551CSC	56%	44%	1.24
17	1855	#693-555	57%	43%	0.97
18	1856	#693-555	57%	43%	0.74
19	1857	#551CSC	56%	44%	1.15
20	1858	#435-7	Wet mix	Wet mix	0.29
21	1859	#734-161	Wet mix	Wet mix	0.18
22	1860	Blank	–	–	0.00
23	1861	#238	–	–	2.02
24	1862	#551DSC	55%	45%	2.38
25	1863	#551D-333	55%	45%	1.75
26	1864	#47E	–	–	2.31
27	1865	#551D-333	55%	45%	0.84
28	1866	#551D-333 #47E	55% –	45% –	1.31
29	1867	Blank	–	–	0.00

FRICTION PRODUCTS GROUP

WINCHESTER, VIRGINIA

APPENDIX #3

Sample No. Field	Lab.	Medical Study No.	Work Habits	Worker Height	Fiber Count >5μ/ml
1	1839	3C-4418	Clean	6 ft.	1.46
2	1840	3C-730	Dirty	5'6"	1.75
3	1841	3C-4059	Dirty	6 ft.	4.10 (80 mix)
4	1842	3C-735	Clean	6'1"	1.73
5	1843	3C-424	Clean	5'8"	1.20
6	1844	-	Blank	-	0.00
7	1845	3C-2095	Clean	6'1"	2.99
8	1846	Post	-	-	0.60
9	1847	3C-727	Clean	6 ft.	1.11
10	1848	3C-735	Clean	6'1"	1.68
11	1849	3C-4059	Dirty	6 ft.	3.59 (80 mix)
12	1850	3C-4418	Clean	6 ft.	1.46
13	1851	3C-730	Dirty	5'6"	1.54
14	1852	3C-767	Clean	5'9"	0.50 (wet mix)
15	1853	3C-4473	Clean	5'10"	0.43 (wet mix)
16	1854	3C-4059	Dirty	6 ft.	1.24
17	1855	3C-735	Clean	6'1"	0.97
18	1856	3C-4059	Dirty	6 ft.	0.74
19	1857	3C-735	Clean	6'1"	1.15
20	1858	3C-4473	Clean	5'10"	0.29 (wet mix)
21	1859	3C-767	Clean	5'9"	0.18 (wet mix)
22	1860	-	Blank	-	0.00
23	1861	3C-014	Clean	5'10"	2.02
24	1862	3C-168	Dirty	6 ft.	2.38
25	1863	3C-4418	Clean	6 ft.	1.75
26	1864	3C-730	Dirty	5'6"	2.31
27	1865	3C-4418	Clean	6 ft.	0.84
28	1866	3C-730	Dirty	5'6"	1.31
29	1867	-	Blank	-	0.00

FRICTION PRODUCTS GROUP
WINCHESTER, VIRGINIA
APPENDIX #4

Sample No. Field	Lab.	Date	Medical Study No.	Location	Fiber >5μ
1	1839	10-1-74	3C-4418	Book preform #13 (new exhaust design)	1
1	1839	"	"	Book preform #9 (old exhaust design)	
2	1840	10-1-74	3C-730	Book preform #15 (old exhaust design)	1
2	1840	"	"	Book preform #16 (old exhaust design)	
12	1850	10-1-74	3C-4418	Book preform #15 (old exhaust design)	1
12	1850	"	"	Book preform #16 (old exhaust design)	
13	1851	10-1-74	3C-730	Book preform #13 (new exhaust design)	1
13	1851	"	"	Book preform #9 (old exhaust design)	
25	1863	10-3-74	3C-4418	Book preform #13 (new exhaust design)	1
25	1863	"	"	Book preform #9 (old exhaust design) Sample taken without experimental enclosure	
26	1864	10-3-74	3C-730	Book preform #12 (old exhaust design)	2
26	1864	"	"	Book preform #16 (old exhaust design) Sample taken without experimental enclosure	
27	1865	10-3-74	3C-4418	Book preform #13 (new exhaust design)	[illegible]
27	1865	"	"	Book preform #9 (old exhaust design) Sample taken with experimental enclosure	
28	1866	10-3-74	3C-730	Book preform #12 (old exhaust design)	[illegible]
28	1866	"	"	Book preform #16 (old exhaust design) Sample taken with experimental enclosure	

FRICTION PRODUCTS GROUP
WINCHESTER, VIRGINIA
APPENDIX #5

Sample No. Field	Lab.	Date	Medical Study No.	Location	Fiber Cou $>5\mu/ml$
3	1841	10-1-74	3C-4059	Block preform #5 (80 mix) double cavity	4.10
4	1842	10-1-74	3C-735	Block preform #17 (551C mix) single cavity	1.73
10	1848	10-1-74	3C-735	Block preform #10 (551D mix) single cavity	1.68
11	1849	10-1-74	3C-4059	Block preform #5 (80 mix) double cavity	3.59
16	1854	10-2-74	3C-4059	Block preform #5 (551CSC mix) double cavity	1.24
	1855	10-2-74	3C-735	Block preform #17 (555 mix) single cavity	0.97
18	1856	10-2-74	3C-4059	Block preform #17 (555 mix) single cavity	0.74
19	1857	10-2-74	3C-735	Block preform #5 (551CSC mix) double cavity	1.15

FRICTION PRODUCTS GROUP
WINCHESTER, VIRGINIA
APPENDIX #6

Sample No. Field	Sample No. Lab.	Date	Medical Study No.	Location	Fiber Cour $>5\mu/ml$
14	1852	10-2-74	3C-767	Roll Machine #3 (435-7 mix) wet mix No local exhaust ventilation	0.50
15	1853	10-2-74	3C-4473	Roll machine #4 (734-161 mix) wet mix No local exhaust ventilation	0.43
20	1858	10-2-74	3C-4473	Roll machine #3 (435-7 mix) wet mix No local exhaust ventilation	0.29
21	1859	10-2-74	3C-767	Roll machine #4 (734-161 mix) wet mix No local exhaust ventilation	0.18

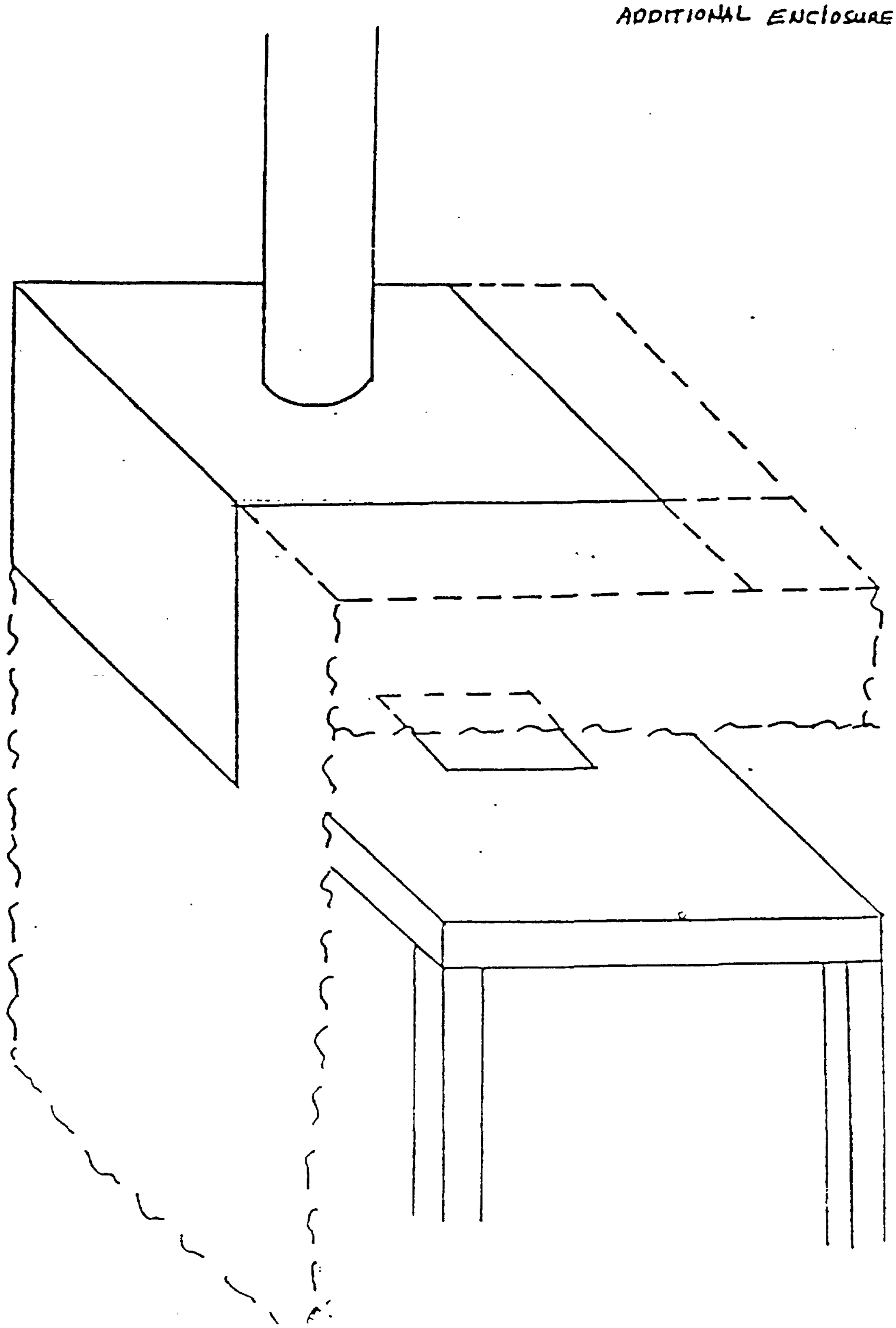
SKETCH #1

BOOK PREFORM

PRESENT ENCLOSURE = ——

ADDITIONAL ENCLOSURE (WOOD) = —

ADDITIONAL ENCLOSURE (plastic) = ~



WINCHESTER, VIRGINIA

EMPLOYEE NAME MEDICAL STUDY NUMBER REFERENCE

NAME	MEDICAL STUDY NO.
James Morris	3C-4418
Loring McDaniel	3C-730
Richard Kesner	3C-4059
T. L. Smeltzer	3C-735
Robert Dove	3C-724
Edward Woods	3C-2095
Richard Carpenter	3C-727
Gordon Miller	3C-767
Dennis Voit	3C-4473
Douglas Clark	3C-014
Thomas Kane	3C-168

ABEX CORPORATION
INDUSTRIAL HYGIENE SURVEY
FRICTION PRODUCTS GROUP
WINCHESTER, VIRGINIA
APRIL 19-23, 1976

ORIGINAL: C. B. Mallory
CC: C. C. Blackwell, Jr., M.D.
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E. H. Feierabend
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G. Nicholson
M. C. Rauch, R.N.
D. K. Rennie
J. P. Fagan, IC Industries

Blackwell 6
November 19, 1984

ABEX CORPORATION
INDUSTRIAL HYGIENE SURVEY
FRICTION PRODUCTS GROUP
WINCHESTER, VIRGINIA
APRIL 19-23, 1976

PURPOSE

This Industrial Hygiene survey was conducted to determine the extent of occupational disease exposure to airborne asbestos, lead, and solvent vapors. Recommendations for control are enumerated in the report.

SUMMARY

Of the 48 samples collected for airborne asbestos, thirteen exceeded the present limit of 5 fibers/ml greater than 5 microns in length, and twenty-six including the thirteen noted above, exceeded the 2 fiber limit which is scheduled for adoption by OSHA in July of this year. The majority of the exposures were confined to Book Preform and Blok Preform with lighter excursions observed at the dry line operation in Lower Compounding and at Disc Brake Inspection. Duplicate and triplicate samples were collected at seven of the aforementioned operations which accounts for 14 of the 48 samples. Averaging of the multiple samples revealed 8 hour time weighted levels at three blok preform units of from 5 to 6 fibers/ml. Fiber counts of multiple sample locations in Book Preform revealed average levels of 4 to 5 fibers/ml. Historically, book preform levels have been generally lower than those observed during this survey. The excursions were not anticipated since the installation of the hoods around the preformers should have significantly reduced the fiber counts. The increase may be attributable to normal ambient variations, but it is likely that housekeeping and excessive reliance on the systems by the operators are also factors. In addition, the mix buggies are not yet ventilated, and floated fibers are clearly visible where the operators lean over and scoop mix from the buggies.

The two short term samples taken from the dry line operator in Lower Compounding reveal that this operator is overexposed if we observe the 2 fiber limit. This obviously arises during loading of the mix buggies from the hoppers and to a lesser extent during shifting and transfer of the wheeled containers.

The three samples collected at Disc Brake Preform showed an unusual reduction in airborne fibers. Only one of the units (No. 3) has been redesigned to any extent and would not account for the dramatic decline at all units to 0.43, 0.8, and 0.53 fibers/ml from previous levels above the five fiber limit. Since the asbestos hoppers above the preform machines were not manually filled at any time during the sampling periods, the omission could account for the reduced exposure. Heavy concentrations of airborne asbestos are generated during this phase of the operation.

One other location, Disc Brake Inspection, was found to be above the 2 fiber limit. Inspection exposures are generally caused by dust adhering to the surface of the brake pads. Steps should be taken to reduce this exposure either through precleaning of the pads or provision of adequate exhaust ventilation.

All collected asbestos samples were also analyzed for airborne lead. As indicated in Appendix 2, only two of the samples reached or exceeded the Threshold Limit Value of 0.15 mg/M^3. The locations involved included Blok Preform No. 15 and Blok Preform No. 5. Since these were short-term samples, the listed values (Sample 19, .149 mg/M^3 and sample 25, .197 mg/M^3) do not represent time weighted concentrations or averaging over an 8 hour workday. The only inference that can be drawn from the values is that they may be representative of the airborne lead concentrations present during any other short term period during the 8 hour workday. This may or may not be the case. Blok Preform No. 5, which was sampled twice, showed the aforementioned short term level of .197 mg/M^3 and an earlier level of 0.137 mg/M^3 for an average of 0.167 mg/M^3. Since both exposure locations were Blok Preform units, it is apparent that further collection system improvements are needed.

Personal samples of printing inks were taken at Blok Finish Printer No. 2, Strip Finish Hand Printer No. 2, and Strip Finish Printer Machine No. 10. As anticipated, airborne concentrations of the methyl ethyl ketone solvent in the different inks were minimal, ranging from 2.17 mg/M^3 to 59.23 mg/M^3 versus the Threshold Limit Value of 590 mg/M^3. From the standpoint of a fire and explosion hazard, ambient concentrations are not a problem since the Lower Explosive Limit is over 53,000 mg/M^3 in air. However, smoking and open flames in the immediate vicinity of the printing units should be prohibited.

Vapors concentrated directly above a spill or open container of MEK can easily reach or exceed the lower explosive limit.

RECOMMENDATIONS

76-1 Existing exhaust ventilation design at blok preform units excludes shrouding or hooding which is the only effective way to contain floated asbestos fibers. As discussed in provious reports, each blok preform unit should be completely enclosed by an exhausted enclosure except for required access openings. If possible, the weigh scale should be incorporated into this enclosure.

76-2 Exhausted enclosures at the blok and book preform units should be provided for the mix buggies, or the mix should be confined in exhausted hoppers in such a manner that scooping and manual weighing can be eliminated or minimized.

76-3 Frequency of clean up of spilled, scattered asbestos mix at blok and book preform should be increased. Vacuum pickup should be used exclusively for this purpose.

76-4 Steps should be taken to reduce exposures at Disc Brake Inspection either through precleaning of the pads or provision of adequate local exhaust ventilation. It can be assumed that if one inspector is exposed, others in the immediate vicinity are also subject to exposure.

76-5 Although exposure levels were low at disc preform during this survey, it is likely that significant exposures still exist at Disc Preform Units No. 1 and No. 2. Hoppers similar to that installed at Disc Preform No. 3 should also be made available at units 1 and 2 to eliminate manual loading of the raw fibers.

76-6 The dry line operator in Lower Compounding should be provided with and required to wear an approved particulate respirator during filling of the mix buggies.

76-7 All operators in Blok Preform, Book Preform, and Disc Brake Inspection should be provided with and required to wear approved particulate respirators until ventilation controls have been proven to be adequate. This is a fundamental protective requirement which should not be further delayed. (Repeat recommendation)

76-8 Posting requirements in locations where excessive fiber levels are present are not being observed. Caution signs should be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers. This is an OSHA requirements as set forth in the Code of Federal Regulations, and is listed herein as a repeat recommendation dating back to our survey reports of August 14-18, 1972, October 2-6, 1972, and September 10-14, 1973.

76-9 Employees are not being notified of their own excessive exposure to airborne asbestos so that they can take appropriate protective measures whether it be through the consistent use of respirators or more careful work habits. Employees should be notified in writing of their personal exposure as soon as practicable, but not later than 5 days of the finding. They should also be advised of the corrective action being taken. This is an OSHA requirement as set forth in the Code of Federal Regulations, and is listed herein as a repeat recommendation dating back to our survey reports of August 14-18, 1972, October 2-6, 1972, and September 10-14, 1973.

DISCUSSION

During the survey, two or more short term samples were collected at each of several operators, particularly in Book and Blok Preform, to obtain averages of levels throughout the day. These particular locations are listed below with the actual and averaged values.

LOCATION	ACTUAL LEVELS fibers/ml	AVERAGE fibers/ml
Book Preform #19	3.78 and 4.26	4.02
Book Preform #2	4.41 and 6.85	5.63
Book Preform #4	3.56 and 6.55	5.05
Blok Preform #5	8.74, 3.01, and 5.19	5.65
Blok Preform #2	7.10, 4.41, and 5.33	5.61
Blok Preform #7	5.42 and 6.76	6.1

It would have been ideal if 5 separate samples could have been taken at each location for purposes of closer averaging and to comply with OSHA sampling requirements. However, in this instance, time was limited since some asbestos counting was done on site in addition to sample collection. The above data do show fluctuations, but none are extreme, and it is apparent that the averages are reasonably representative of actual 8 hour time weighted exposure levels. The short term method of sampling is necessary when airborne particulate concentrations are elevated. Prolonged sampling at some locations overloads the filter, preventing accurate identification and sizing of fibers during microscopic examination. When this happens, erroneous fiber levels of from 10 to 100 times below actual concentrations may be reported.

As indicated in Appendix No. 1, book and blok preform samples continued to show elevated fiber levels, especially when related to the 2 fiber limit scheduled for adoption by OSHA in July. Since ventilation changes have not resulted in noticeable reduction from levels of December 16-20, 1974, it is apparent that sources or points of major dust release at each blok and book preform unit have not been adequately ventilated. Most past survey reports have stressed the need for proper exhaust enclosure of the mix buggies and hand transfer portions of the processes. This need is again reiterated. It is our understanding that engineering controls are to be installed at the mix buggy locations in Blok Preform in the near future. These plans should also include Book Preform where hooding installations have helped to reduce scattering and spillage, but have had moderate effect on airborne fiber concentrations.

A recent Industrial Hygiene survey at Salisbury-FPG has disclosed preform fiber levels ranging from 0.5 to 1.5 fibers/ml. One or two locations were above 2 fibers/ml, but the reasons for the excursions were easily pinpointed and were attributable solely to poor work practices. The mix buggies and weigh scales are provided with exhaust ventilation at the Salisbury plant which appears to be containing effectively airborne asbestos levels, at least to the 2 fiber level. It is suggested that FPG-Winchester inspect the mix buggy enclosures at Salisbury and consider adopting some or all of their principles of asbestos containment.

There appears to be no clear pattern of asbestos exposure as it relates to the type of mix being used at the individual work station. Careless work habits and/or excessive scattering of the mix can be assumed to be a factor, but there are no pronounced variations except for airborne lead levels within the survey data to support this contention. The operator at blok preform No. 5 was selected for sampling because of the presence of asbestos mix on floors, equipment, and clothing, and excessive dust generation during scooping and weighing. The levels during three different sampling periods were 8.74 fibers/ml, 3.01 fibers/ml, and 5.19 fibers/ml. These values do not vary significantly from those encountered at more fastidious blok preform operations. This lack of effect of personal variables tends to further indicate that the source of excessive asbestos exposure is common in origin. Remaining, heavy sources of exposure at both book and blok preform are the mix buggies and the manual operations associated therewith.

In relation to the airborne lead results in Appendix No. 2, excursions above the 0.15 mg/M^3 Threshold Limit Value were confined to two locations in Blok Preform. One of the locations was blok preform No. 5 (sample No. 25) which, as previously stated, was selected for sampling because of excessive dust generation and poor housekeeping conditions. This operator also worked at Blok Preform No. 3 during the morning hours (sample No. 10) where airborne lead levels were high (.135 mg/M^3) but not above the Threshold Limit Value. It would be adviseable to provide this operator with instructions as to proper work habits and the need for consistent good housekeeping.

Throughout the plant, it was observed that only a few people were wearing respirators. In known exposure areas, only one man was so equipped. This operator's respirator was not worn continuously during dusty operations, but was only worn when the operator himself felt that protection was warranted. I inspected the respirator after the operator had deposited it on a dusty ledge, and found it to be dirty, and smudged both inside and out, and the filter was thoroughly caked with asbestos fibers and particulates.

It is imperative that a respiratory protection program be established in the plant whereby all exposed employees are provided with and required to wear approved, properly maintained respiratory protection. This recommendation has been set forth in several previous reports. Although respirators are provided on a voluntary basis within the plant, this is not sufficient since virtually all of the exposed employees remain unprotected. To have any positive or lasting effects the program must be implemented on a mandatory basis. In addition, the employees should be thoroughly instructed in the use of the equipment, and a central maintenance program should be established.

Maintenance is an important phase of any control procedure, and is as true for respirators as it is for ventilation equipment. No matter how well a respirator is designed, how good its performance, it cannot give satisfactory protection unless it is maintained in good condition. This is one of the most frequently neglected factors, particularly with routinely used respirators. The operations of a maintenance program, including frequent inspections, cleaning, replacing, or repairing worn or deteriorated parts, and storage, should be centralized. They should also be supervised carefully by a responsible and capable person since proper care and maintenance requires a thorough knowledge of the devices.

All routinely used respirators should be inspected frequently. The tightness of connections should be checked, as well as the condition of the facepiece, exhalation and inhalation valves, connecting tubes and/or cartridges, and cannisters.

Respirators should be cleaned after each use, and they should be collected at a central point at the end of each shift for cleaning and inspection. Each employee's respirator should bear some sort of identification, such as his initials or clock number. When a worker receives a respirator, he should be briefed on the cleaning procedure and assured that he will always get the same device. If the respirators are serviced between shifts, only one respirator per worker is needed. If the cleaning is done during a shift, each worker will require two respirators. When not in use, the respirators should be stored in clean cabinets at convenient locations in the work area. As long as each respirator is assigned to only one person, there is no reason to require special sterilizing. Scrubbing with warm water and soap, rinsing, and air drying is adequate. When the respirator is used by only one individual, a practical method of cleaning is as follows:

1. Remove the filter or cartridge and discard.

2. Wash in detergent or soap in warm water.

3. Rinse completely in clean, warm water.

4. Air dry the device in a clean area.

5. Inspect the valves, headstraps, and other parts; replace with new parts if defective.

6. Insert new filters or cartridges; make sure the seal is tight.

7. Place in a plastic bag for storage.

After cleaning, inspection, and necessary repair, the respirators should be stored in dustproof containers, away from sunlight, heat, extreme cold, and excessive moisture. Plastic bags are adequate for routinely used respirators. They should not be stored in clothes lockers or tool boxes. Care should be taken to see that they are packed or stored so that the rubber facepiece and exhalation valve will rest in a normal position and function will not be impaired by the rubber setting in a bent or twisted position.

CONCLUSIONS

Housekeeping had been improved at several locations throughout the plant, particularly in Lower and Upper Compounding. Further improvement is needed in Blok and Book Preform.

Significant asbestos exposures are limited to two departments where design and installation of exhaust equipment are underway. Efforts should be concentrated on ventilating mix buggies and ancillary manual operations in both Book and Blok Preform. Interim protection in the form of respirators should be provided for the operators. Use of the devices should be a condition of employment in these two areas.

Isolated asbestos exposures at Disc Brake Inspection and the dry line operation in Lower Compounding require engineering control. Interim protection in the form of respirators should be provided for the operators.

I would like to thank Bob Brown and Charles Mallory for their consideration and support during the course of the survey.

SURVEYED BY: M. David Gidley

M. David Gidley, Certified Industrial Hygienist

6/30/76

ABEX CORPORATION
INDUSTRIAL HYGIENE SURVEY
<u>GLOSSARY</u>

cfm	- cubic feet per minute
Daily noise dose	- A numerical expression of the total noise exposure an employee receives during the day. If the daily noise dose exceeds 1.00, the noise exposure to the employee is excessive.
dBA	- Decibels symbol denoting the relative intensity of sound pressure levels (re: 0.0002 dyne/square centi meter)
fpm	- feet per minute
GRA	- General Room Atmosphere
mg/M^3	- milligrams per cubic meter of air
MS#	- Medical Study No.
›pcf	- million particles per cubic foot of air
NIOSH approved	- Approved by the National Institute for Occupational Safety and Health
OBZ	- Operator's Breathing Zone
ppm	- parts per million by volume
PS	- Personal Sample
TLV	- Threshold Limit Value for an 8 hour daily exposure
Ventilation	- The terms ventilated, ventilating, or exhaust imply the use of mechanical means such as a fan for air movement unless otherwise noted.

CONVERSION CHART
DAILY NOISE DOSE/8 HOUR EXPOSURE
TO dBA/8 HOUR EXPOSURE

Daily Noise Dose/8 hr.		dBA/8 hr.	Permissible Employee Work Exposure Time
0.50		85	16 hours
1.00	← OSHA MAX. LIMIT →	90	8 hours
1.14		91	7 hours
1.33		92	6 hours
1.50		93	5.33 hours
1.71		94	4.67 hours
2.00		95	4 hours
2.28		96	3½ hours
2.67		97	3 hours
2.99		98	2.67 hours
3.43		99	2.33 hours
4.00		100	2 hours
4.57		101	1.75 hours
5.33		102	1.50 hours
6.01		103	1.33 hours
6.83		104	1.17 hours
8.00		105	1.00 hours
8.88		106	0.90 hours
10.00		107	0.80 hours
11.42		108	0.70 hours
13.33		109	0.60 hours
16.00		110	0.50 hours
17.17		111	0.45 hours
20.00		112	0.40 hours
22.85		113	0.35 hours
26.66		114	0.30 hours
32.00		115	Less than 0.25

19661 · 15

APPE X No. 1
FPG - WINCHESTER
ANALYSES OF AIR SAMPLES FOR ASBESTOS

THOD OF COLLECTION: ODZ-PS_ membrane
lter with personal sampling pump at 2LPM

THOD OF ANALYSIS: Phase Contrast
croscopy

DATE ANALYZED: 5/27-28/76
ANALYST: M. Desouky
TLV: 2 fibers/ml >5μ in length
(effective 7/76)

mple No. Field	Lab.	Date	Time	Total (M^3) Air Vol.	Location	fibers/ml Conc.	OPERATOR
1	633-G	4/20/76	9:50am 10:37am	.093	Book preform #19 mix No. 551-D	3.78*	W. D. Bowen
2	634-G	"	9:46am 10:35am	.094	Book preform #2 mix No. 555	4.41*	Robert Weaver
3	635-G	"	9:53am 10:38am	.089	Book preform #20 mix No. 555	2.91*	J. F. Ganoe
4	636-G	"	9:56am 10:40am	.086	Book preform #4 mix No. 551-D	3.56*	Martha Ratlief
5	637-G	"	9:58am 10:44am	.092	Book preform #13 mix No. 551-D	3.97*	George Brown
6	638-G	"	10:00am 10:44am	.086	Book preform #14 mix No. 27E	7.12*	Holmes Patton
7	639-G	"	10:04am 10:45am	.080	Book preform #16 mix No. 551-D	4.70*	James Morris
8	640-G	"	10:07am 10:47am	.076	Book preform #21 mix No. 551-D	5.96*	O. W. Turner
9	641-G	"	10:11am 10:46am	.068	Book preform-transient operator	9.18*	Nelson Spencer
10	642-G	"	10:20am 10:53am	.065	Blok preform #5 mix No. 555	8.74*	Joanna Powell
11	643-G	"	10:20am 10:54am	.049	Blok preform #2 mix No. 562-5	7.10*	Sally Albert
12	644-G	"	10:30am 10:55am	.046	Blok preform #1 mix No. 551-D	6.98*	Douglas Rinard

(*) Concentration in excess of TLV.

-19661 5

APPENDIX . 1
FPG - WINCHESTER
ANALYSES OF AIR SAMPLES
FOR ASBESTOS

:THOD OF COLLECTION: OBZ-PS - Membrane ilter with personal sampling pump at 2 LPM
:THOD OF ANALYSIS: Phase Contrast icroscopy

DATE ANALYZED: 5/27-28/76
ANALYST: M. Desouky
TLV: 2 fibers/ml >5μ in length (effective 7/76)

ample No. ield	Lab.	Date	Time	Total (M³) Air Vol.	Location	fibers/ml Conc.	OPERATOR
13	645-G	4/20/76	10:20am 10:50am	.059	Blok preform #7 mix No. 551	5.42*	Louis Nicholson
14	646-G	"	10:35am 10:56am	.037	Book preform #2 mix No. 555	6.85*	Robert Weaver
15	647-G	"	10:37am 10:57am	.038	Book preform #19 mix No. 551-D	4.26*	W. D. Bowen
16	648-G	"	Blank	Blank	Book Preform	Blank	Blank
17	649-G	"	10:40am 10:58am	.034	Book preform #4 mix No. 551-D	6.55*	Martha Ratlief
18	650-G	"	1:40pm 2:21pm	.065	Blok preform #5 mix No. 555	3.01*	Joanna Powell
19	651-G	"	1:54pm 2:26pm	.064	Blok preform #15 mix No. 551	4.06*	Ralph Elosser
20	652-G	"	1:44pm 2:10pm	.052	Blok preform #2 mix No. 551	4.41*	Sally Albert
21	653-G	"	1:46pm 2:12pm	.052	Blok preform #7 mix No. 562-5	6.76*	Louis Nicholson
22	654-G	"	2:05pm 2:20pm	.046	Blok preform #11 mix No. 539	11.47*	Glen Llewellyn
23	655-G	"	Blank	Blank	Blok preform	Blank	Blank
24	656-G	"	2:10pm 2:32pm	.042	Blok preform #2 mix No. 551	5.33*	Sally Albert
25	657-G	"	2:21pm 2:44pm	.044	Blok preform #5 mix No. 551-D	5.19*	Joanna Powell

(*) Concentration in excess of TLV.

APPENDIX 0. 1
FPG - WINCHESTER
ANALYSES OF AIR SAMPLES
FOR ASBESTOS

METHOD OF COLLECTION: OBZ-PS -Membrane filter with personal sampling pump at 2 LPM
METHOD OF ANALYSIS: Phase Contrast Microscopy

DATE ANALYZED: 5/27-28/76
ANALYST: M. Desouky
TLV: 2 fibers/ml >5u in lengt (effective 7/76)

Sample No. Field	Sample No. Lab.	Date	Time	Total (M^3) Air Vol.	Location	fibers/ml Conc.	OPERATOR
26	658-G	4/21/76	10:07am 2:42pm	.506	Inspection and packaging	0.78	James Bayliss
27	659-G	"	10:02am 2:03pm	.470	Strip finish O.D. grinder #2	0.56	George Chambers
28	660-G	"	10:20am 2:27pm	.437	Lower compounding rubber mill No. 1	1.01	James Royston
29	661-G	"	10:05am 2:10pm	.475	Strip finish backgrinder #3	0.14	Allan Carter
30	662-G	"	10:12am 2:14pm	.462	Disc brake insp.	3.07*	Eugene Willingham
31	663-G	"	10:28am 2:16pm	.442	Insp.(Grouping) at downdraft bench	0.62	Robert Clark
32	664-G	"	10:23am 2:26pm	.459	Lower Compounding Rubber Mill No. 3	0.66	Marcus Haines
33	665-G	"	11:30am 2:36pm	.342	Upper Compounding Dry Line Oper.	0.34	C. B. Fauver
34	666-G	"	11:40am 1:43pm	.243	Upper Compounding Powder pumper	0.38	Joseph Palmer
35	667-G	"	11:45am 1:50pm	.263	Lower compounding Dry Line oper.	4.53*	A. M. Foreman
36	668-G	"	11:31am 2:35pm	.388	Upper Compounding Powder pumper	0.71	Gene Kline
37	669-G	"	11:35am 1:45pm	.255	Upper compounding Asbestos weigher	1.45	S. A. Dodson

(*) Concentration in excess of TLV.

APPENDIX 1. 2
FPG - WINCHESTER
ANALYSES OF AIR SAMPLES
FOR lead in air

ETHOD OF COLLECTION: OBZ-PS-Membrane
'ilter with personal sampling pump at 2 LPM
ETHOD OF ANALYSIS: Atomic Absorption
'pectroscopy

DATE ANALYZED: 5/27/76
ANALYST: M. Desouky
TLV: 0.15 mg/M^3

ample No. Field	Lab.	Date	Time	Total (M^3) Air Vol.	Location	Conc. mg/M	OPERATOR
1	633-G	4/20/76	9:50am 10:37am	.093	Book preform #19 mix No, 551-D	Trace	W. D. Bowen
2	634-G	"	9:46am 10:35am	.094	Book preform #2 mix No, 555	Trace	Robert Weaver
3	635-G	"	9:53am 10:30am	.089	Book preform #20 mix No. 555	Trace	J. F. Ganoe
4	636-G	"	9:56am 10:40am	.086	Book preform #4 mix No, 551-D	Trace	Martha Ratlief
5	637-G	"	9:50am 10:44am	.092	Book preform #13 mix No. 551-D	.076	George Brown
6	638-G	"	10:00am 10:44am	.086	Book preform #14 mix No, 27E	.045	Holmes Patton
7	639-G	"	10:04am 10:45am	.080	Book preform #16 mix No. 551-D	Trace	James Morris
8	640-G	"	10:07am 10:47am	.076	Book preform #21 mix No. 551-D	Trace	O. W. Turner
9	641-G	"	10:11am 10:46am	.068	Book preform trans- lant operator	Trace	Nelson Spencer
10	642-G	"	10:20am 10:53am	.065	Blok preform #3 mix No, 555	.135	Joanna Powell
11	643-G	"	10:28am 10:54am	.049	Blok preform #2 mix No. 562-5	Trace	Sally Albert
12	644-G	"	10:30am 10:55am	.046	Blok preform #1 mix No. 551-D	Trace	Douglas Rinard

(*) Concentration in excess of TLV.

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APPENDI). 2
FPG - WINCHESTER

ANALYSES OF AIR SAMPLES
FOR LEAD IN AIR

ETHOD OF COLLECTION: OBZ-PS-Membrane filter with personal sampling pump at 2 LPM

ETHOD OF ANALYSIS: Atomic Absorption Spectroscopy

DATE ANALYZED: 5/27/76
ANALYST: M. Desouky
TLV: 0.15 mg/M^3

ample No. Field	Lab.	Date	Time	Total (M^3) Air Vol.	Location	Conc. mg/M^3	OPERATOR
13	645-G	4/20/76	10:20am 10:50am	.059	Blok Preform #7 mix No. 551	Trace	Louis Nicholson
14	646-G	"	10:35am 10:56am	.037	Book preform #2 mix No. 555	Trace	Robert Weaver
15	647-G	"	10:37am 10:57am	.038	Book preform #19 mix No. 551-D	Trace	W. D. Bowen
16	648-G	"	Blank	Blank	Book preform	0.0	Blank
17	649-G	"	10:40am 10:58am	.034	Book preform #4 mix No. 551-D	Trace	Martha Ratlief
18	650-G	"	1:40pm 2:21pm	.065	Blok preform #5 mix No. 555	.137	Joanna Powell
19	651-G	"	1:54pm 2:26pm	.064	Blok preform #15 mix No. 551	.149*	Ralph Ellosser
20	652-G	"	1:44pm 2:10pm	.052	Blok preform #2 mix No. 551	Trace	Sally Albert
21	653-G	"	1:46pm 2:12pm	.052	Blok preform #7 mix No. 562-5	Trace	Louis Nicholson
22	654-G	"	2:05pm 2:28pm	.046	Blok preform #11 mix No. 539	Trace	Glen Llewellyn
23	655-G	"	Blank	Blank	Blok Preform	0.0	Blank
24	656-G	"	2:10pm 2:32pm	.042	Blok preform #2 mix No. 551	Trace	Sally Albert
25	657-G	"	2:21pm 2:44pm	.044	Blok preform #5 mix No. 551-D	.197*	Joanna Powell

-19661

APPENDI .O. 2
FPG - WINCHESTER
ANALYSES OF AIR SAMPLES
FOR Lead in Air

:THOD OF COLLECTION: ODZ-PS-Membrane filter with personal sampling pump at 2 LPM
:THOD OF ANALYSIS: Atomic Absorption Spectroscopy

DATE ANALYZED: 5/27/76
ANALYST: M. Desouky
TLV: 0.15 mg/M^3

:mple No. Field	Lab.	Date	Time	Total (M^3) Air Vol.	Location	Conc. mg/M	OPERATOR
26	658-G	4/21/76	10:07am 2:42pm	.506	Inspection and packaging	Trace	James Daylios
27	659-G	"	10:02am 2:03pm	.470	Strip finish O.D. grinder #2	Trace	George Chambers
28	660-G	"	10:20am 2:27pm	.437	Lower compounding rubber mill No. 1	Trace	James Royston
29	661-G	"	10:05am 2:10pm	.475	Strip finish backgrinder #3	Trace	Allan Carter
30	662-G	"	10:12am 2:14pm	.462	Disc brake insp.	Trace	Engene Willingham
31	663-G	"	10:28am 2:16pm	.442	Insp.(Grouping) at downdraft bench	Trace	Robert Clark
32	664-G	"	10:23am 2:26pm	.459	Lower Compounding rubber mill No. 3	Trace	Marcus Haines
33	665-G	"	11:30am 2:36pm	.342	Upper compounding dry line oper.	.069	C. D. Fauver
34	666-G	"	11:40am 1:43pm	.243	Upper compounding powder pumper	Trace	Joseph Palmer
35	667-G	"	11:45am 1:58pm	.263	Lower compounding dry line operator	Trace	A. M. Foreman
36	668-G	"	11:31am 2:35pm	.368	Upper compounding powder pumper	Trace	Gene Kline
37	669-G	"	11:35am 1:45pm	.255	Upper compounding asbestos weigher	Trace	S. A. Dodson

(*) Concentration in excess of TLV.

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APPENDI .O. 2

FPG - WINCHESTER
ANALYSES OF AIR SAMPLES
FOR Lead in Air

METHOD OF COLLECTION: ODZ-PS-Membrane filter with personal sampling pump at 2 LPM

METHOD OF ANALYSIS: Atomic Absorption Spectroscopy

DATE ANALYZED: 5/27/76
ANALYST: M. Desouky
TLV: 0 15 mg/M3

Sample No. Field	Sample No. Lab.	Date	Time	Total (M3) Air Vol.	Location	Conc. mg/M3	OPERATOR
38	670-G	4/21/76	11:38am 2:37pm	.360	Upper compounding dry line operator	Trace	C. M. Jones
39	671-G	"	1:45pm 2:39pm	.102	Upper compounding asbestos weigher	Trace	S. A. Dodson
40	672-G	"	1:58pm 2:25pm	.052	Lower compounding dry line operator	Trace	A. M. Foreman
41	673-G	"	4:08pm 6:40pm	.287	Strip finish ripper No. 2	Trace	Robert Dean
42	674-G	"	4:11pm 7:00pm	.347	Compound helper (coal screening)	.048	Elwood Hentz
43	675-G	4/22/76	4:53pm 7:03pm	.258	Grouping-Mezzanine	Trace	Holmes Curl
44	676-G	4/21/76	4:23pm 6:38pm	.267	Plant sweeper 2nd shift	Trace	Winifred Henry
45	677-G	4/22/76	10:39pm 12:45am	.250	Maintenance oper. 3rd shift	Trace	Paul Jones
46	678-G	4/23/76	9:53am 11:48am	.222	Disc Brake Preform No. 3	Trace	R. L. Dove
47	679-G	"	9:57am 11:45am	.214	Disc brake preform No. 1	Trace	William Moreland
48	680-G	"	10:09am 11:49am	.180	Blok Finish I.D." Grinder No. 1	Trace	Donald Arnold
49	681-G	"	10:10am 11:49am	.201	Blok finish Burr Chamfer No. 2	Trace	Ed Farrell
50	682-G	"	9:55am 11:47am	.227	Disc brake preform No. 2	Trace	Douglas Clark

(*) Concentration in excess of TLV.

-19661 .5

APPENDI O. 3
FPG - WINCHESTER

ANALYSES OF AIR SAMPLES
FOR Methyl Ethyl Ketone

ETHOD OF COLLECTION: OBZ-PS-Personal sampling pump with activated charcoal absorption tubes

ETHOD OF ANALYSIS: Gas Chromatography

DATE ANALYZED: 5/6/76
ANALYST: M. Desouky
TLV: 590 mg/M^3

ample No.		Date	Time	Total (M^3) Air Vol.	Location	Conc. mg/M^3	OPERATOR
ield	Lab.						
1	630-G	4/23/76	9:49am 10:20am	.024	Blok finish printer No. 2	3.13	Richard Renner
2	631-G	"	9:43am 10:23am	.03	Strip finish hand printer No. 2	2.17	Calvin Fox
3	632-G	"	10:01am 10:39am	.03	Strip finish printer machine No. 10	59.23	Stephen Michael

(*) Concentration in excess of TLV