

PLAINTIFF'S
EXHIBIT

04900-00

DUST-PRODUCING POTENTIAL OF CONSTRUCTION MATERIALS

PHASE II

REPORT TO HEALTH AND SAFETY COMMITTEE
NATIONAL INSULATION MANUFACTURERS ASSOCIATION

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"DUST-PRODUCING POTENTIAL OF CONSTRUCTION MATERIALS, PHASE II"

Partially as a result of last year's study, "Dust-Producing Potential of Construction Materials", a new insulation material not containing asbestos was commercially developed. This product, Unibest, is a substitute for the asbestos-containing material, Unibestos.

The same protocol as proposed and followed in the last study was duplicated for the testing of Unibest.

The following operations (described in greater detail below) were performed on each product by an insulation mechanic (journeyman asbestos worker).

- I. Simulation of pipe covering, and tear-out of heat stressed pipe covering.
- II. Power sawing of the products to simulate on-site fabrication of specific shapes of the material by a bandsaw; and the "scoring" of blocks.
- III. Pounding with a simulated hammer to estimate the effects of force-fitting (not performed by the insulation mechanic).

In each of these operations (except the tear-out and pounding), the insulation mechanic was permitted to set his own pace; the specific plan of operations was determined in consultation with him so that practices usual to the trade were followed.

The insulation mechanic used a "Whitecap" supplied-air respirator throughout the tests.

Sampling and Analysis

Air samples were taken by drawing air through Nuclepore 0.8 μ m mean pore size membrane filters. Millipore 0.8 μ m mean pore size membrane was used for the elutriator samples. Filters of 37 mm diameter were used for the personal breathing zone samples and 47 mm diameter filters for all other samples.

During the simulated pipe covering, tear-out, and bandsawing, samples were taken at five locations within the test chamber: 1) in the middle of the chamber, with the open-face filter holder 8 feet above the chamber floor level ("Roof" samples); 2) from a support projecting into the chamber approximately 1 foot from the wall opposite the work bench on which the covering was done, through an open-face filter holder about 6 feet above the floor ("Room" samples); 3) above the work bench (near the wall closest to the bench) with an open-face filter holder ("Bench" samples); 4) in the same location as the Bench samples but with the air drawn through a Hexhlet Horizontal Elutriator (Casella-Wilson) before passage through the in-line filter holder ("Elutriator" samples); 5) in the insulator's breathing zone with disposable Millipore Field Monitors (open face) ("Personal" samples). Sample air flow rates were: Roof, 1.26 cubic feet per minute (cfm); Room, 0.84 cfm; Bench, 0.86 cfm; Elutriator, 50.0 liters per minute (1.7 cfm) Personal, 0.11 cfm. See Figures I and II of last year's report for these locations.

During the scoring operation, only two sampling locations were utilized (Room and Personal samples) as shown in Figures I and II of the last report.

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The pounding operation was monitored with four samplers, one on the bench above the product being pounded ("Bench top") and three others approximately 5 feet distant from the pounding site, 4 feet above floor level. One of these filter holders was directed upward ("Up"), another directed downward ("Down"), and the other directed horizontally ("Horizontal"). Flow rates here were 0.86 cfm for the Mass, 0.84 cfm for the Down, and 1.3 cfm for the remaining two. These locations are shown in Figures III and IV of the last report.

Analysis of the collected samples was directed at obtaining two measures of the relative amount of dust production from the products being tested. All filters (except selected 37 mm Personal sample filters) were weighed before and after use, each such weighing preceded by desiccation for two hours to stabilize weights. From this weight data, the gravimetric concentrations of total airborne dust were computed in milligrams per cubic meter (mg/m^3) by dividing the milligrams' change in weight by the total cubic meters of air which had passed through the filter. This was the sole analysis applied to the "Roof", "Room", "Bench", and "Elutriator" samples.

The Personal sample filters were analyzed to determine the concentrations of mineral fibers (selected ones were weighed). This analysis was by the standard method for the determination of asbestos fibers collected on membrane filters: a wedge of the weighed, exposed filter was cut from the filter and the wedge (about 1/8 of the total filter) placed on a standard microscope slide on which was placed a drop of a mounting medium which matched the index of refraction of the organic filter. The filter wedge

thus "cleared" was examined with phase contrast microscopy at 430X magnification, with the microscopic field of examination limited to the area bounded by a Porton eyepiece reticle (0.0061 mm^2 per field). The mineral fibers seen in each field were recorded and placed into several length and diameter categories.

Specific Operations

All operations were identical to those described in the previous report.

Results (Pipe Covering)

Tables 1 and 2 show the results of the air sampling for these operations, expressed as milligrams of total particulate per cubic meter of air (mg/m^3), total mineral fibers per milliliter of air (f/ml), as compared to the Unibestos results of the previous study. Figure I presents all products used in the previous study as compared to the new Unibest (B_2) for pipe covering operations. The tear-out is graphed in Figure II.

Results (Bandsaw)

The bandsawing results are listed as total mineral fibers per milliliter in Table 3 and total particulate, milligrams per cubic meter, in Table 4. Figure III compares the results to the last study.

Results (Scoring)

Table 5 and Table 6 show the scoring results along with the comparisons of the previous study, Figure IV.

Results (Pounding)

Table 7 gives the results from this experiment. Figure V compares results with the previous study.

TOTAL AIRBORNE DUST (GRAVIMETRIC) *
CONCENTRATIONS FROM ALL PIPE COVERING OPERATIONS

TABLE 1

PROCESS	ROOF		ROOM		BENCH		FLUTRIATOR	
	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS
Hand	1.59		3.2		2.8		0.4	
Sawing	2.89		3.5		3.7		3.3	
	2.05		13.0		4.8		5.9	
Mean	2.2	13.5	6.6	10.5	3.7	17.7	3.2	8.8
STANDARD DEVIATION	0.7	8.6	5.6	8.1	1.0	11.2	2.7	8.5
Application	4.7		0.5		2.3		- 0.28	
	3.1		0.8		4.9		4.8	
	4.0		3.9		3.0		0.7	
Mean	3.9	11.5	3.1	9.3	3.4	6.9	1.8	3.96
STANDARD DEVIATION	0.8	1.8	1.4	0.8	1.4	0.9	2.7	3.4
Tenrout	83.26	19.16	93.40	27.29	69.59	55.37	5.5	3.71

* MG/M³

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AIRBORNE MINERAL FIBERS
CONCENTRATIONS* FROM ALL
PIPE COVERING OPERATIONS

TABLE 2

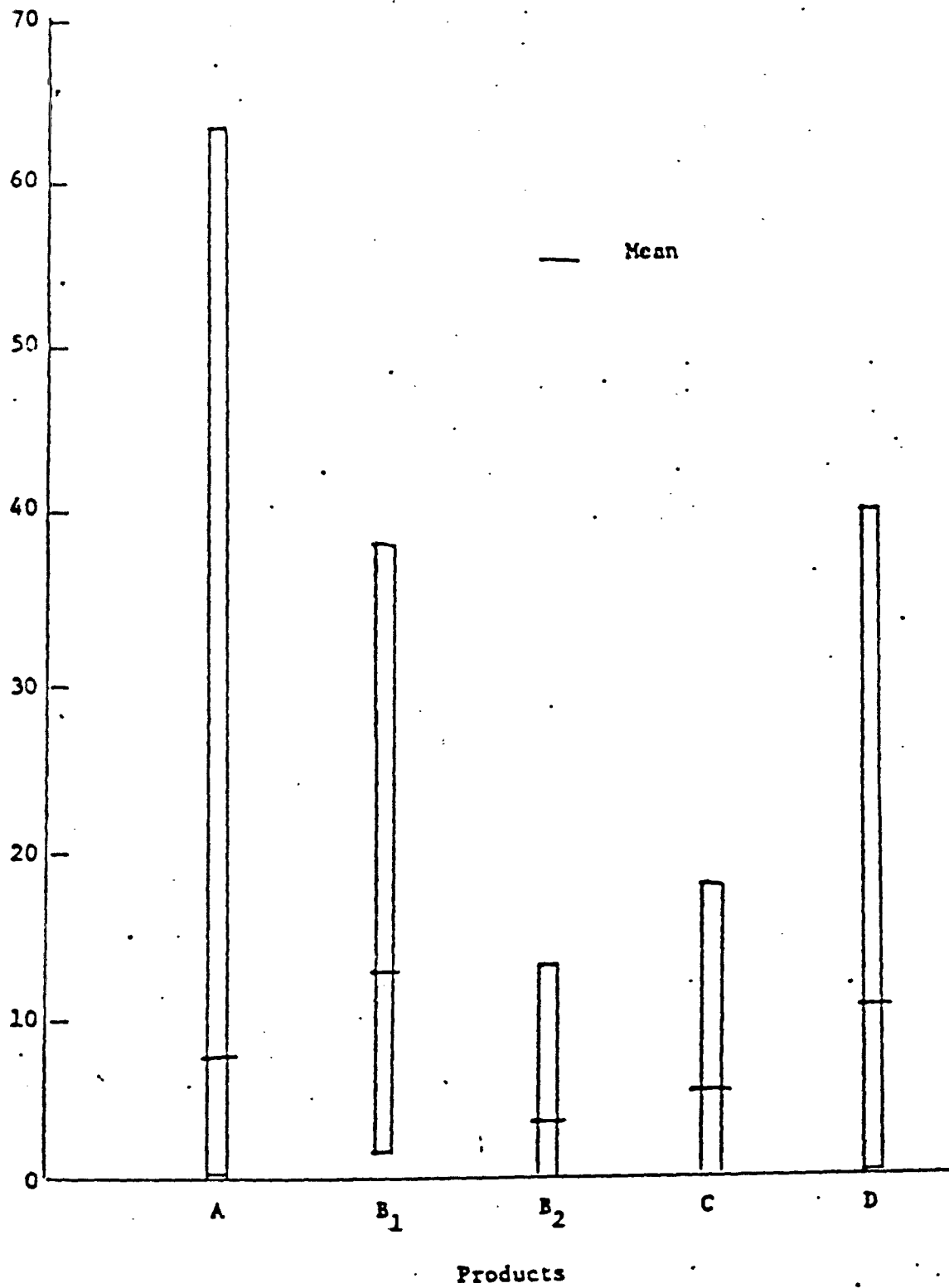
PROCESS	PERSONAL		ROOF		ROOM	
	UNIBEST MINERAL FIBERS	UNIBESTOS ASBESTOS FIBERS	UNIBEST MINERAL FIBERS	UNIBESTOS ASBESTOS FIBERS	UNIBEST MINERAL FIBERS	UNIBESTOS ASBESTOS FIBERS
HAND SAWING	2.44		0.43		0.71	
	2.19		0.89		0.85	
	5.77		1.50		0.63	
MEAN	3.5	193.80	0.9	127.1	0.73	94.5
STANDARD DEVIATIONS	2.0	57.48	0.5	56.9	0.11	57.5
APPLICATION	1.4		0.7		0.1	
	1.1		0.9		0.6	
	1.4		0.6		0.95	
MEAN	1.3	113.9	0.8	42.1	0.6	32.1
STANDARD DEVIATION	0.17	51.6	0.2	7.5	0.4	7.1
TEAROUT	26.55	268.40	-	-	-	-

* F/ML

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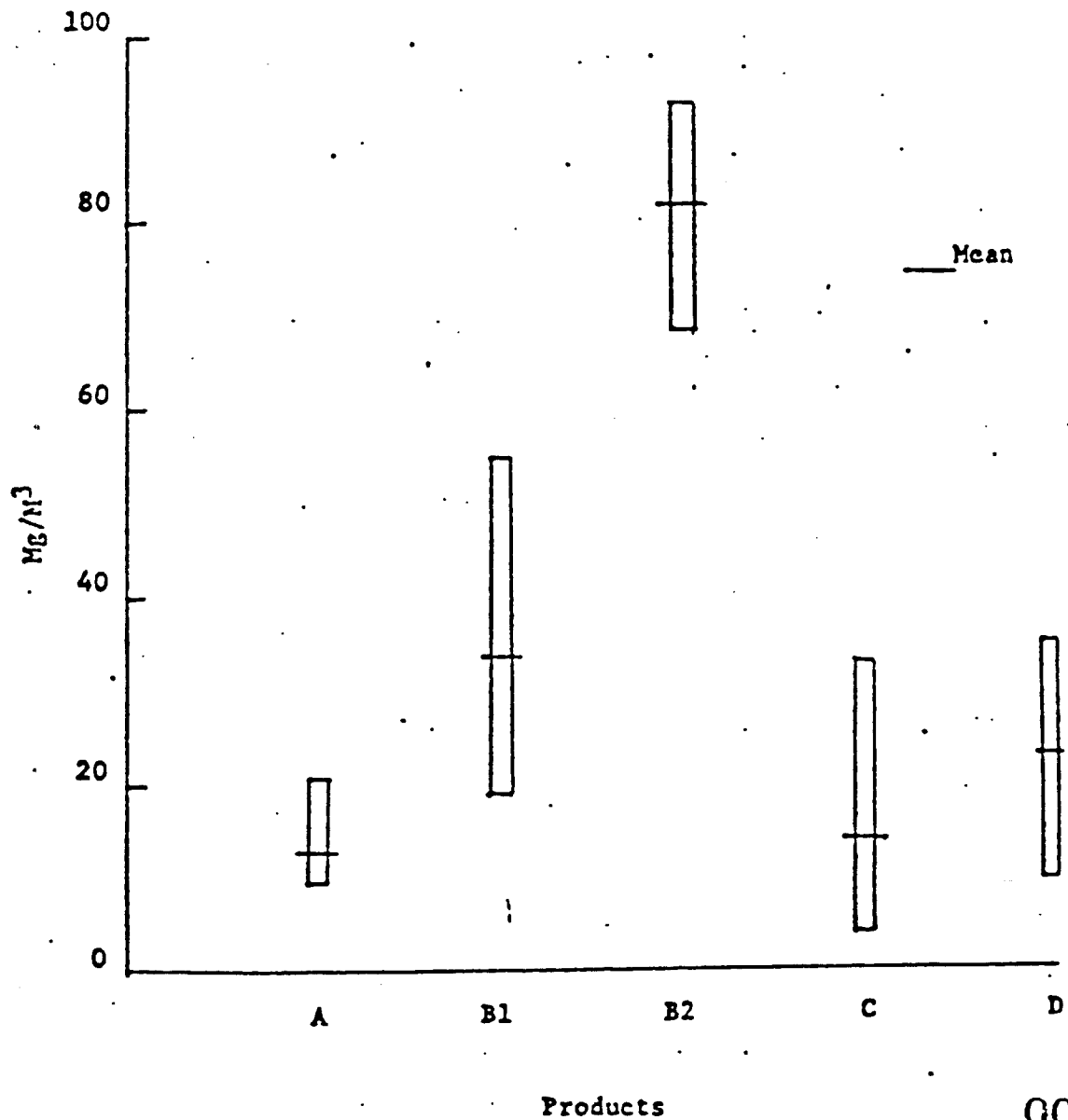
Figure I

Ranges and Means for
All Samples - Applications



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Figure II
Ranges & Means
For All Samples - Tearout



AIRBORNE MINERAL FIBERS
CONCENTRATIONS* FROM BANDSAWING

TABLE 3

	PERSONAL	
	UNIBEST MINERAL FIBERS	UNIBESTOS ASBESTOS FIBERS
	13.94	
	24.70	
	30.52	
MEAN	23.05	754.76
STANDARD DEVIATION	8.41	376.22

*F/ML

TOTAL AIRBORNE DUST (GRAVIMETRIC) *
CONCENTRATIONS FROM BANDSAWING

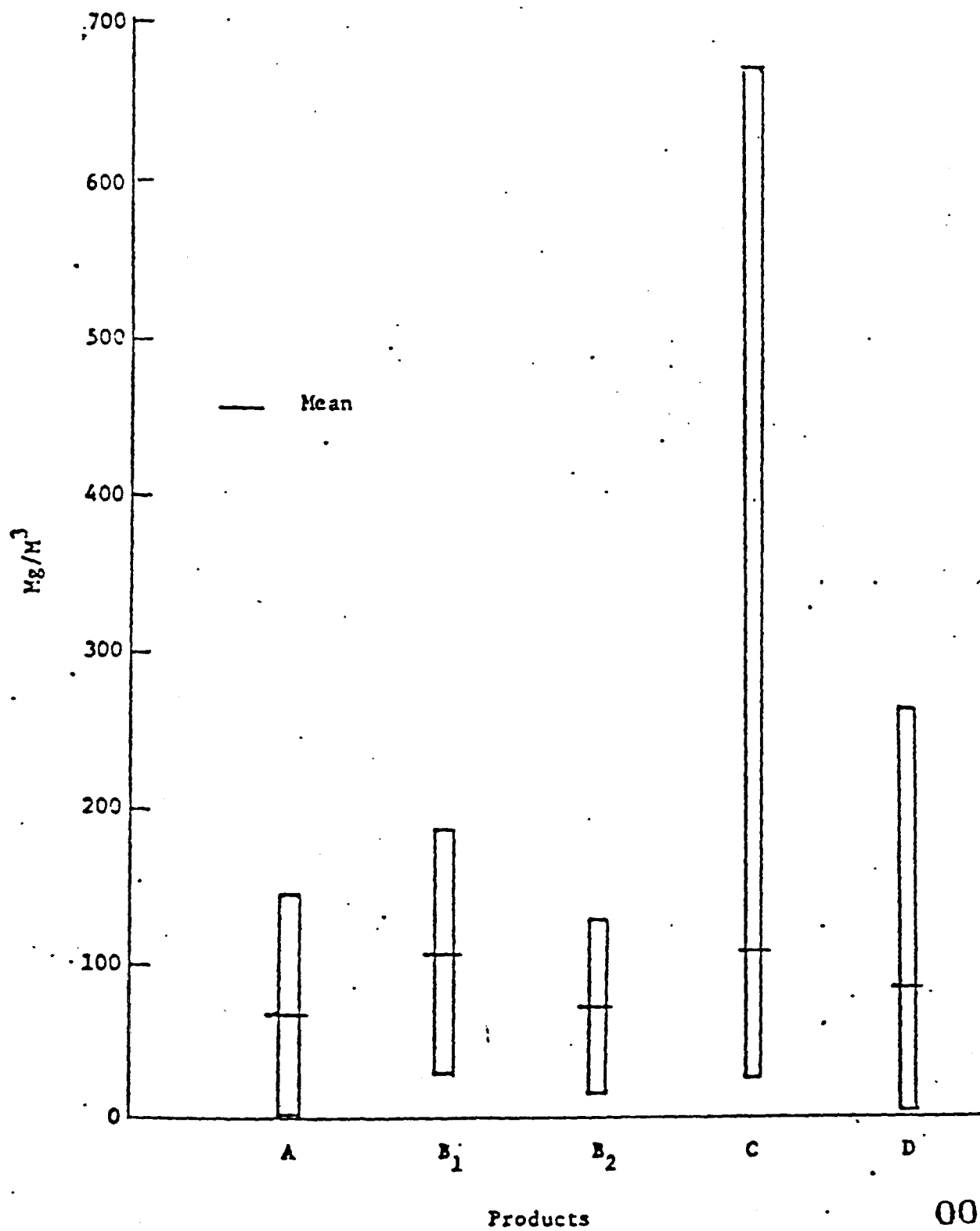
TABLE 4

	ROOF		ROOM		BENCH		ELUTRIATOR	
	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS
	22.91		17.43		73.33		12.17	
	56.02		35.86		125.16		6.48	
	99.95		121.60		105.82		26.93	
MEAN	59.63	103.90	58.30	47.19	101.45	172.29	15.19	
STANDARD DEVIATION	38.65	67.50	55.59	23.40	26.20	15.47	10.55	

* Mg/M³

Figure III

Ranges and Means for
All Samples - Bandsawing



AIRBORNE MINERAL FIBERS
CONCENTRATIONS * FROM SCORING

TABLE 5

	PERSONAL	
	UNIBEST MINERAL FIBERS	UNIBESTOS ASBESTOS FIBERS
	55.89	
	109.48	
	24.18	
MEAN	63.18	2629.74
STANDARD DEVIATION	43.12	444.84

*F/ML

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TOTAL AIRBORNE DUST (GRAVIMETRIC) *
CONCENTRATIONS FROM SCORING

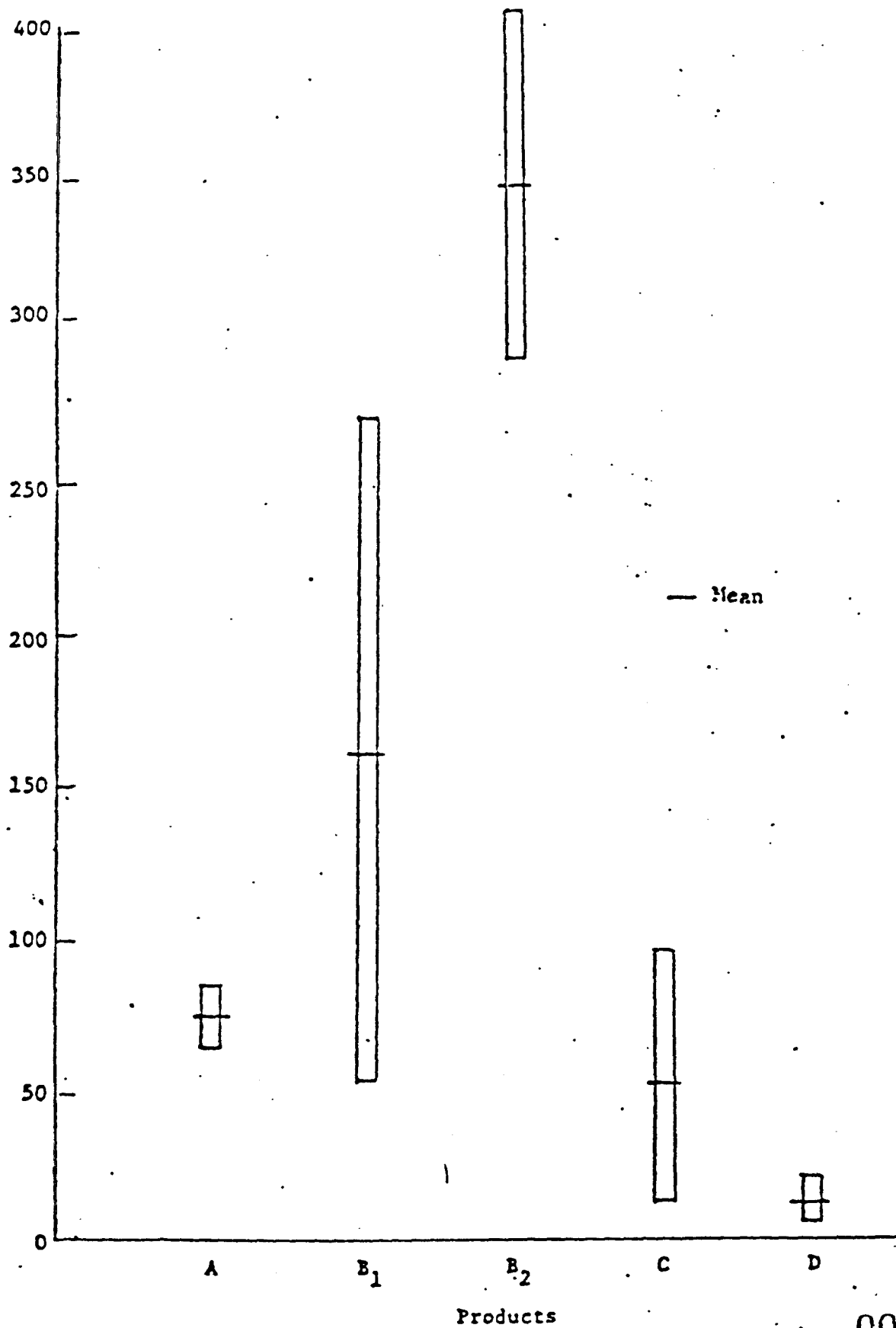
TABLE 6

	ROOM	
	UNIBEST	UNIBESTOS
MEAN	288.16	
	403.43	
	345.80	159.83
STANDARD DEVIATION	81.51	151.96

* Mg/M^3

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Figure IV Ranges and Means for
All Samples - Scoring



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TOTAL AIRBORNE DUST (GRAVIMETRIC) *
CONCENTRATIONS FROM POUNDING

TABLE 7

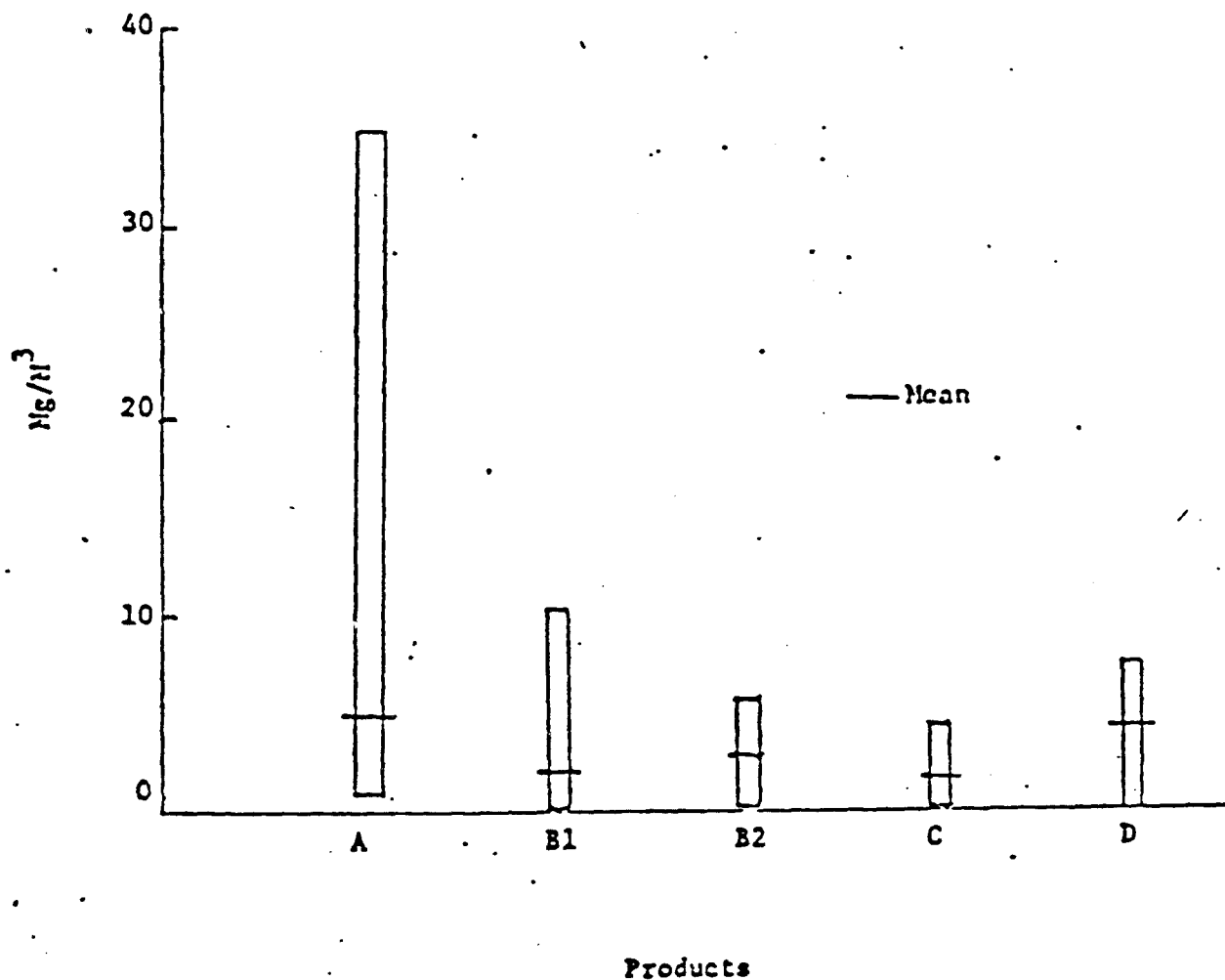
	BENCH TOP		UP	DOWN	HORIZONTAL
	UNIBEST	UNIBESTOS	UNIBEST	UNIBESTOS	
MEAN			2.57		
			0.67		
			3.38		
			4.20		
			2.83		
			3.65		
	3.27		4.20		
	2.87		1.26		
	5.74		2.94		
	3.96	3.57	2.86		1.06
STANDARD DEVIATION	1.55	1.73	1.22		3.71

* Mg/M^3

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Figure V

Ranges & Means
For All Samples - Pounding



Discussion of Results

It is clear from these results that Unibest is a definite improvement over the previous product Unibestos, not only in that the asbestos fibers have been removed but also in the production of total dust from most installation processes. The amount of dust left from the normal operation of handsawing and application is presented in Table 8. The diameter fiber differs in that the mineral fiber in the aerosol averages $4.2 \mu\text{m}$ versus Unibestos at $1.7 \mu\text{m}$.

Mechanical operations using saws produced total gravimetric concentrations of airborne particulate matter above the proposed TLV of $10 \text{ mg}/\text{m}^3$ for inert dusts. From analysis of the data, it would indicate that the high concentration would occur in the immediate area and settle out relatively quickly. Figure VI compares the mean values for all operations, milligrams per cubic meter (mg/m^3), with the results of the last tests. Overall, the total airborne dust concentration is similar to the calcium silicate products tested previously. However, the absence of asbestos fibers in Unibest results in a nuisance dust condition rather than an overt biological hazard, i.e., asbestos exposure.

DEBRIS FROM PIPE COVERING
OPERATIONS, IN OUNCES

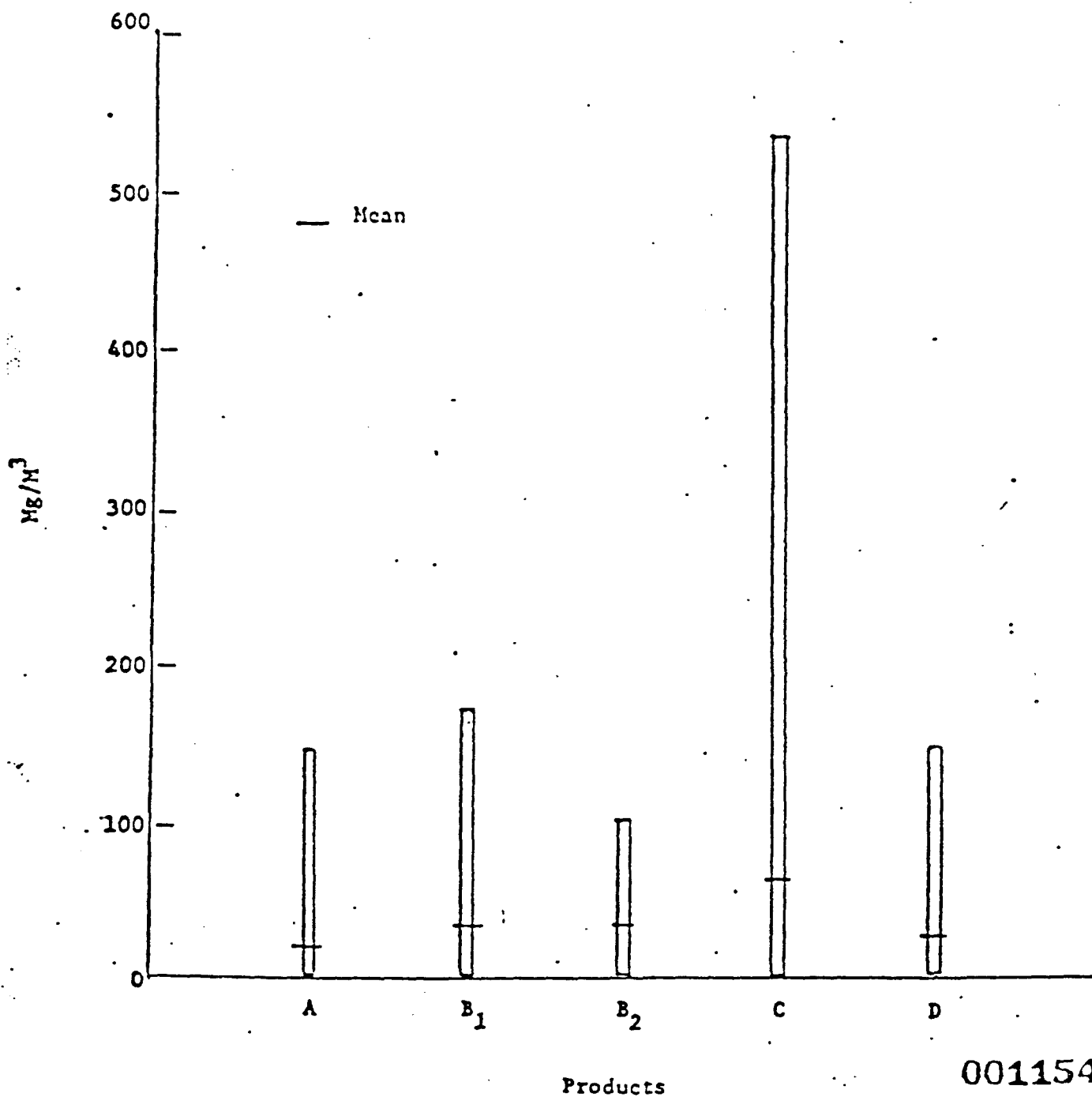
TABLE 8

DEBRIS		
	UNIBEST	UNIDESTOS
	5.0	11.0
	4.0	11.0
	4.5	13.0
MEAN	4.5	12.6

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Figure VI

Accumulated Ranges and Means
for all samples (except scoring)



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Conclusions

1. General installation operations of Unibest produce less total airborne particulate matter than Unibestos.
2. Comminution (mechanical methods) results in airborne concentration of particulates greater than the proposed nuisance TLV dust value, 10 mg/m³.

BULLETIN

No. 256

8-16-71

MEETINGS, AUGUST 17, 1971, OF THE EMPLOYEES OF THE
FOLLOWING DEPARTMENTS AND SHIFTS ARE SCHEDULED IN
THE ENGINEERING ROOM IN THE PLANT OFFICE AT THE FOL-
LOWING TIMES:

7:30 A. M.	3RD SHIFT PRODUCTION
8:00 A. M.	1ST SHIFT PRODUCTION
1:30 P. M.	SHIPPING/RECEIVING & MAINTENANCE
2:30 P. M.	FINISHING DEPARTMENT
4:00 P. M.	2ND SHIFT PRODUCTION

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