Pltf X-4
10-7-81 MCF

INTERNAL CORRESPONDENCE

UNION CARBIDE CHEMICALS COMPANY • INSTITUTE PLANT P. O. BOX 2831, CHARLESTON, WEST VIRGINIA

(Name) Mr. S. C. Giambruno
mpany
al Industrial Relations

Date 4 December 1962

Originating Dept. Medical Department - Plant 512

Answering letter date

py to Mr. L. N. Dickinson, Mr. G. H. Daniels, Mr. N. S. Eastman, Mr. R. A. Huber, Mr. B. F. King, Mr. F. B. Snyder, Dr. E. M. Best, Jr., Mr. E. G. Heinz, Mr. P. E. Henry, Mr. R. A. Neal, Mr. D. R. Matheny, Mr. N. H. Ketcham, Dr. C. U. Dernehl

Subject Insulation Block Dust Survey
Construction Insulation Shop
Plant 511

PLAINTIFF'S EXHIBIT
UC-5227

Two reports by Mr. R. E. Peele have been issued on this subject (21 March 1962 and 20 July 1962) and sent out under my signature. On 16 May 1962, a copy of a letter from Doctor Nale to the UCC Central Purchasing Department in New York pertaining to this subject was sent to some of the people on the above distribution list. Undoubtedly, Johns Manville is extremely interested in having our Construction Department use their "Thermobestos" blocks. However, I believe that possibly unnecessary pressure is being applied to us from several sources.

The enclosed report by Mr. Peele includes information on an invitation for Mr. Peele to visit Manville, New Jersey, at Johns Manville's expense to evaluate their industrial hygiene studies. Mr. Peele points out in this report also that he has been contacted recently by the Design and Construction Department at the Technical Center who have implied that Mr. Peele should comply with Johns Manville's proposal.

It is my opinion that we should continue to do surveys, with limitations, on samples of "thermobestos" blocks that are of a new formula and are submitted to our Construction Insulation Shop at the Institute Plant for evaluation. However, I am not in favor of Mr. Peele accepting Johns Manville's invitation and would appreciate approval or disapproval for this trip from my supervision so that Mr. Peele can be informed accordingly.

Very truly yours,

R. J. Sexton, M.D.
Plant Medical Director

RJS:gh
Enclosure

INTERNAL CORRESPONDENCE

UNION CARBIDE CHEMICALS COMPANY • INSTITUTE PLANT P. O. BOX 2831, CHARLESTON, WEST VIRGINIA

o (Name) R. J. Sexton, M.D.
ompany
:c. Medical Department

Date 3 December 1962
Originating Dept. Industrial Hygiene - Plant 512
Answering letter date
Subject Johns Manville "Thermobestos"

opy to

On 21 March 1962, an Industrial Hygiene Report, i.e., 62-IH-1-6-1, identified the existence of a hazard to health in the Construction Insulation Shop during such times as when insulation blocks manufactured by the Johns Manville Company are being fabricated with exhausted band saws. It was recommended at that time that 18" x 36" x 4" "Thermobestos" insulation blocks* should not be fabricated with the existing equipment unless --

(a) The atmospheric dust problem could be reduced to below 20 mppcf of air through the use of ventilation, etc., or

(b) The producer of this product begins manufacturing an insulation block which will not release upon fabrication with a band saw, dust concentrations in excess of 20 mppcf of air.

In accordance with these recommendations, the Construction Insulation Shop discontinued almost immediately the purchase of "Thermobestos" insulation blocks.

On 20 July 1962, a second Industrial Hygiene Report, i.e., 62-IH-2-G-1, was submitted subsequent to an evaluation of three new insulation materials supplied by the Johns Manville Company. This report concluded that these materials were improved over the original. However, the dust concentrations produced upon fabrication of these insulation blocks were substantially in excess of the recommended safe concentrations of 20 mppcf of air. Therefore, the recommendations contained in this report remained exactly as those stated in the initial report of March, 1962.

On 20 November 1962 the author was contacted by Mr. D. R. Matheny, General Foreman of the Insulation Shop, who stated that three Johns Manville representatives, i.e., Messers. F. E. Saxer, N. Gordon, and H. E. Kaufman, were present and had requested a meeting with the Plant Industrial Hygienist. This meeting was held in the lobby of Building 2, at which time Mr. Saxer produced the accompanying copy of portions of a report submitted by the Johns Manville Industrial Hygiene Laboratory located at Manville, N.J. Mr. Saxer stated that, in accordance with this report, they were not able to produce results which agreed with those contained in the reports submitted by this department. Therefore, they were concerned and interested in learning if their methods of reproducing

*The Johns Manville trade name for their insulation blocks

our environmental conditions, sampling and evaluating the dust concentrations contained therein were subject to question. At this point he stated also that this conclusion was promoted on the basis of their analysis of the atmospheric dust conditions produced by their competitors product, (i.e., Kaylo or Item # 5AT in the report) which in no way agreed with the data submitted in the Industrial Hygiene Report - IH-62-I-G-I.

It was explained at this point, that this department's interest in this problem is always confined solely to the environmental conditions as they effect the health of our workers, and that no part of the investigation should be construed as an attempt to arbitrarily promote the use of one company's product over that of another.

Upon completion of this statement, Mr. Saxer proposed that Mr. D. R. Matheny and the Plant's Industrial Hygienist make a trip to Manville, New Jersey, at Johns Manville's expense and at a time selected by Union Carbide. This visit would be for the specific purpose of observing, scrutinizing and comparing their method of atmospheric dust evaluation with that as utilitized by the Institute Plant's Industrial Hugiene Department. It was Mr. Saxer's opinion that such a visit would permit a more positive approach to the problem and remove the possibility of misunderstandings, etc., that results from written correspondence. At this point, Mr. Saxer was assured that there would be no personal objection on my part to the performance of such a service. However, a proposal of this nature would have to be submitted to the Plant Manager, Mr. L. N. Dickinson, through appropriate channels before a final decision could be made.

In conclusion, it should be stated that a phone call was received from Mr. F. G. Comerford of Design and Construction on the morning of 21 November 1962, who requested that he be brought up to date on this specific problem. This request was immediately satisified both by verbal explanation and by the promise that copies of both reports, i.e., 62-IH-I-G-I and 62-IH-2-G-1, would be mailed to him immediately. Mr. Comerford further stated that we should not back down on our requirements, but that it probably might be wise to consider their proposal in light of the many ramifications of the problem as it affects the whole company structure, i.e., purchasing, sales, manufacturing, etc.

Very truly yours,

Robert E. Peele

Robert E. Peele
Industrial Hygienist

REP:gh

Enclosure

DISCUSSION

Atmospheric dust concentration tests were made on October 30, 1963, during the fabrication of insulation blocks on the DC-ALL Model L-H-V grind saw in the Southern Center Materials Testing Laboratory sample preparation room. The National Conference of Governmental Industrial Hygienists Test Method was followed using the Greenburgh-Smith impinger. Tests were conducted by Mr. T. F. Bednarchuk of the J-M Industrial Hygiene Laboratory at Manville. To obtain comparative data, the room ventilation was adjusted to give more than the usual amount of atmospheric dust. The test set up is shown in the photograph below.



In addition to the room ventilating system, air was removed from directly above the block at a rate of 37 cu ft per min and from the metal bearing surrounding the saw at a rate of 15 cu ft per min. The saw blade was standard and had six teeth per in. and a linear speed of 8100 ft per min. The blocks were 16 x 11 x 4 or 6 in; and were cut so that the blade entered the 11-in. edge.

Five types of insulation were tested including standard Kennebecs; and three experimental pan coat blocks. Formulas are given in Appendix I. Prior to testing, blocks of each were conditioned by: a) drying a minimum of seven days at 250F; b) drying at 250F and conditioning for 10 days at 70 per cent RH, 70F; c) drying at 250F and conditioning for 10 days at 95-100 per cent RH, 95F.

The test data are given in Appendix II. The dust concentration tests were analyzed and indicated that the superiority reported by Union Carbide of over standard Kennebecs and the experimental pan coat blocks submitted to them is subject to question. The results also indicated that the slate dust composition, 2-12, caused less atmospheric dust than the other types of blocks.

The effect that conditioning of the blocks had on the dust concentration in air was not apparent. This is attributed to the limited amount of material tested and the possibility that an equilibrium condition of dust concentration in the sampling area may not have been reached in some cases. In order to definitely establish the effect moisture content of the blocks has on atmospheric dust a more extensive series of tests would be required. Such tests would also serve to more definitely establish the relative dustiness of the formulas investigated.

[illegible] SURVEY

[illegible] INSULATION SHOP - BUILDING 511-2015

REPORT 62-II-1-S-1

SUMMARY: The industrial hygiene survey, evaluating the dust problem in existence at the Construction Insulation Shop (Building 511-2015) during the time of processing both "Thermobestos" and "Kaylo" insulation blocks, has been completed. The results of this investigation reveal the following conclusive facts:

First - The T.L.V. (Threshold Limit Value) for this material is 20 mppcf (million particles per cubic foot) of air.
Second - The fabrication of "Thermobestos" insulation blocks with band saws produces a definite atmospheric hazard to health.
Third - The fabrication of "Kaylo" insulation blocks with band saws does not constitute a hazard to health.

INTRODUCTION: On 15 November 1961, Mr. S. H. Wilson, Construction Safety Engineer at Plant 512, approached this department with a problem that had been brought to his attention by way of employee complaints. He stated that the "band saw" operators located in the Insulation Shop (Building 511-2015) were experiencing some rather uncomfortable working conditions as they performed their normal routine of ripping "Head Segments" from standard 18" x 36" x 4" insulation blocks. This concern was apparently initiated by virtue of the fact that two insulation materials, reputed to be identical in make-up although produced by different manufacturers, did not react in similar manners to the identical sawing techniques being utilized by the shop. According to statements obtained from the operators, heavy quantities of dust of such large concentrations as to seriously interfere with their normal breathing process, were immediately produced if and when "Thermobestos" blocks (a Johns Manville product) were supplied for sawing. Some dust also resulted whenever "Kaylo" blocks (an Owens Corning product) were handled in a similar manner; however, the quantity of particulate matter being produced from this latter material was hardly noticeable and never objectionable.

This interesting introduction to the problem stimulated a desire to visit the location in question and, while there, to obtain as many answers as possible to the numerous unanswered questions that came to mind upon the completion of Mr. Wilson's description. A visit was arranged and the following facts were noted: (1) Most of the fabricating equipment was connected to a well-known and apparently adequate dust collector by means of well constructed duct work. (2) This exhaust system had obviously been designed to cope with the normal dust problems encountered in most band saw operations. However, the band saw operations in evidence on this date were not what might be termed normal, as a result of the specific shape of the insulation material being fabricated and the particular manner in which each block was being cut. These conditions ruled out the possibility of the exhaust system operating in accordance with its pre-designed efficient manner. Figure 2 on page 15 has been included as an attempt to demonstrate the manner of processing these blocks and the position of the exhaust hoods in relation to the blocks during fabrication.

(3) The [illegible] Insulation Shop was completely open throughout [illegible] was ventilated above by means of six small roof fans. (4) Atmospheric dust samples [illegible] to be taken in various areas of the shed before any evaluation could be made and these would, of necessity, have to be taken when both "Thermobestos" and "Kaylo" insulation materials were being processed separately.

DISCUSSION: On the morning of 21 November 1961, the initial air samples were taken in what proved to be but the first part of a two-phase program of dust evaluation at this location. This first phase was responsible for disclosing the actual concentrations of dust (in millions of particles per cubic foot of air) to which the various men were being exposed as they fabricated first "Thermobestos" and then "Kaylo" with band saws. Atmospheric samples of the "Thermobestos" dust exposures were taken on this initial sampling date whereas similar samples of "Kaylo" dust exposures were, of necessity, taken on 11 December 1961, since these two products are not processed simultaneously.

Five general areas, capable of revealing the most comprehensive information relative to any overall dust exposure, were initially selected and sampling points then spotted in these areas in locations deemed important. The sampling locations are displayed in the Shop [illegible] plan revealed on page 7 The impingement* principle was utilized in the collection of these samples with the Midget Impinger apparatus (as referred to on page 4) serving as the instrument of use. A total of thirteen samples were taken with the first seven being indicative of "Thermobestos" exposures and the latter six being representative of "Kaylo" exposures.

Each of these dust samples were evaluated through the use of light field microscopic counting techniques, referred to on page 4 , with the result of disclosure that some of the locations were quite heavily contaminated with excessive concentrations of dust. This disclosure rendered it imperative that more descriptive information would have to be obtained before an accurate evaluation of the conditions could be formulated, and so the second phase of the program was initiated.

This second phase had the designed purpose of supplying two types of physical data relative to these exposures: (1) the percentage of crystalline free silica present in each material, and (2) the particle size distribution of the air borne portion of each material. This information was deemed essential as a result of the following well-known facts relative to human dust exposures.

It is an uncontested fact that prolonged exposures to excessive concentrations of certain types of atmospheric dust will result in the production of either one of two, or possibly even a combination of both, types of the following lung diseases; i.e., silicosis or asbestosis. It is also known that there are five specific factors that directly influence the production of these diseases. They are: (1) the composition of the dust;

*This means to strike or dash against, as (in this application) the striking or dashing of atmospheric dust particles against the bottom of a small impinger flask containing a specific volume of dust free water as a collecting medium.

i.e., percentage crystalline free silica or [illegible], (2) the number of particles of inhaled dust, (3) the size [illegible] of the dust, (4) the length of time during which [illegible] inhaled, and, (5) the individual susceptibility of [illegible].

Since the determinations revealed that some of the workers were being exposed to dust concentrations of such magnitudes as to exceed even the most lenient of all dust standards, i.e., a T.L.V. (Threshold Limit Value) of 50 mppcf of air (see table below - entry #3) and since it has been revealed (per a Johns Manville representative on 21 November 1961) that this material contained 12.0 - 13.0% asbestos with the remaining 88.0 - 89.0% being entitled, calcium silicate, then it became imperative that conclusive information be obtained which would identify exact quantitative values for two of the five specific factors listed above: i.e., the percentage crystalline free silica present in this material known as calcium silicate and the exact particle size distribution of the respirable portion of such material. The following criteria was used in the evaluation of this data.

First: The actual percentage of crystalline free silica or percentage of asbestos found to be present in a mineral or non-crystalline respirable dust furnishes the basic information required in the establishment of a T.L.V. for the material in question. This selection is arrived at in accordance with criteria as follows:

T.L.V. in mppcf of Air	Substance	Limiting Conditions
5*	Silica as quartz	High percentage crystalline free silica, i.e., above 50%
20*	Silica as quartz	Medium percentage crystalline free silica, i.e., 5 to 50%
50*	Silica as quartz	Low percentage crystalline free silica, i.e., below 5%
5+	Silicate as asbestos	High percentage asbestos, i.e., above 50%
20+	Silicate as asbestos	Medium percentage asbestos, i.e., 5 to 50%
50+	Silicate as asbestos	Low percentage asbestos, i.e., below 5%

* A.C.G.I.H. Threshold Limit Values for 1961, page 11 (April, 1961)
\+ Warren A. Cook, Personal correspondence, 21 February 1962.

Second: "The fraction of an inhaled dust which is retained in the respiratory system and the depth to which the dust [illegible] are sensitively related to particle size. Thus, the size factor is a primary one in determining the magnitude of hazard associated

... inhalation of particulate matter[1]. This ... particle size, its area of deposit, and ... is revealed in the following table:

PARTICLE SIZE	AREA OF DEPOSIT	HAZARD POTENTIAL
Above 5.0 microns	Nasal	None
1.0 - 5.0 microns	Upper respiratory to alveoli	Great to extreme
1.0 micron	Alveoli (most optimum size for alveoli retention)	Extreme
0.25 - 1.0 microns	Alveoli	Extreme

The actual procedure was started on 6 December 1951, at which time two types of samples were obtained. First, a single atmospheric sample of "Kaylo" dust was taken in the area of sand saws #1 and #2, through the use of a Millipore sampler apparatus referred to on page 4 , and particle sizing techniques, as ... to on page ... were then used to determine the particle size distribution of this sample. Second, a direct sample of the actual material was collected and later analyzed for crystalline free silica by two methods, i.e., X-ray diffraction and the latest wet chemical technique, both listed on page 5 . On 4 January 1952, two samples of "Thermobestos" dust were also obtained and evaluated for ... percentage crystalline free silica and particle size distribution in a manner identical with that used on the "Kaylo" material.

PROCEDURES: Both sampling and analytical methods are as follows:

Sampling: (1) All samples used in determining the actual concentrations in air were collected with a midget impinger apparatus which is a hand-cranked, four cylinder suction pump drawing 0.1 cubic foot of air per minute through impinger flasks containing 15 milliliters of double distilled dust free water.

(2) All samples used in obtaining particle size distribution data were collected on Millipore Filters connected to a small battery operated pump. These Cellulose Ester filters are recognized as being the most efficient and adaptable filter material available on the market today being capable of retaining particles down to and below 0.1 micron in size.

Analytical: (1) The actual counting technique, used in this ... is not referred to as the Light Field Microscopic Counting Technique, ... accurately described on pages 152-153 of Industrial Dust by Drinker and Hatch.

1 J. H. Brown, K. M. Cook, F. G. Ney, and Theodore Hatch, American Journal of Public Health, Vol. 40, No. 4 (April, 1950).

(2) The sizing [illegible] from two [illegible] sources. First, the sample was [illegible] permanent mounting method referred to on page [illegible] issue of the A.I.H.A. Quarterly. Second, the actual [illegible] accomplished in accordance with the recommended technique described on pages 166-179 of Industrial Dust by Drinker & Hatch which employs the use of a Filar micrometer, and a standard microscope [illegible] using both the 43X (high and dry) and 97X (oil immersion) [illegible].

(3) Free silica determinations were performed through the use of both of the two following techniques. First, [illegible] entitled, "Determination of Quartz [illegible] Phosphoric Acid" by M. A. Salvidge, Division of [illegible], U. S. Public Health Service, Cincinnati, Ohio, and second, X-ray diffraction techniques as described in the encyclopedia of "[illegible] for Industrial Hygiene", pp. 436-439, and as performed by Mr. H. J. C[illegible], Research and Development Department, Instrumental Methods Group, Union Carbide Chemicals Company.

RESULTS: The physical data listed in the appendix were evaluated and revealed the following facts:

(1) The composition of the dust (Table #5, page 12) is

(a) For "Thermobestos": Asbestos = 12.0 to 13.0%
Crystalline Free Silica = 2.5% [illegible]

(b) For "Kaylo": Asbestos = 12.0 to 13.0%
Crystalline Free Silica = 5.6% [illegible]

(2) The number of particles of atmospheric dust (Table #2, page [illegible]) is revealed to be:

(a) [illegible] greatest concentration in and around the #1 and #2 band saws.
(b) [illegible] greatest concentration when "Thermobestos" is being fabricated.

(3) The particle size of the atmospheric dusts in question (Graphs 1 and 3, pages 13 and 14) is demonstrated to be:

Predominantly 1.0 micron in size for both "Thermobestos" and "Kaylo", but slightly smaller in size for "Kaylo" than for "Thermobestos".

(4) The length of time during which the particles are inhale[illegible] demonstrated in Table 2 page 9) reflects a weighted reduction in the overall dust exposures to both materials.

(5) The individual susceptibility is, in this case, one of those unmeasurable human factors which lends special emphasis to the need for the conscientious use of adequate protective measures deemed essential in the prevention of these incurable diseases.

CONCLUSIONS:

(1) The T.L.V. (Threshold Limit Values) for both of these materials is 20 mppcf (million particles per cubic foot) of air.

(2) The greatest hazard to health is experienced when processing only "Thermobestos" blocks.

(3) The existing ventilation control devices do not adequately control the dust problem being created when "Thermobestos" blocks are processed.

(4) The [illegible] exposure at the [illegible] band saw [illegible] slightly in excess of the T.L.V.

(5) The hazard to health, experienced when fabricating only "Kaylo" blocks is negligible.

(6) The environmental conditions as evidenced, during the time of this survey of the fabrication of "Kaylo" blocks, were not hazardous to health.

(7) "Thermobestos" blocks should not be fabricated with any existing band saw unless a more effective ventilation system is designed and installed in such a manner as to render it capable of reducing the inherent atmospheric dust concentrations to within safe and acceptable limits.

RECOMMENDATIONS:

(1) Do NOT fabricate 18" x 36" x 4" "Thermobestos" insulation blocks with the existing equipment unless:

(a) The atmosphere dust problem can be reduced to below 20 mppcf of air through the use of ventilation, etc., or

(b) The producer of this product begins manufacturing an insulation block which will not release, upon fabrication with a band saw, dust concentrations in excess of 20 mppcf of air.

Submitted by: R E Poole

R. E. Poole
Industrial Hygienist

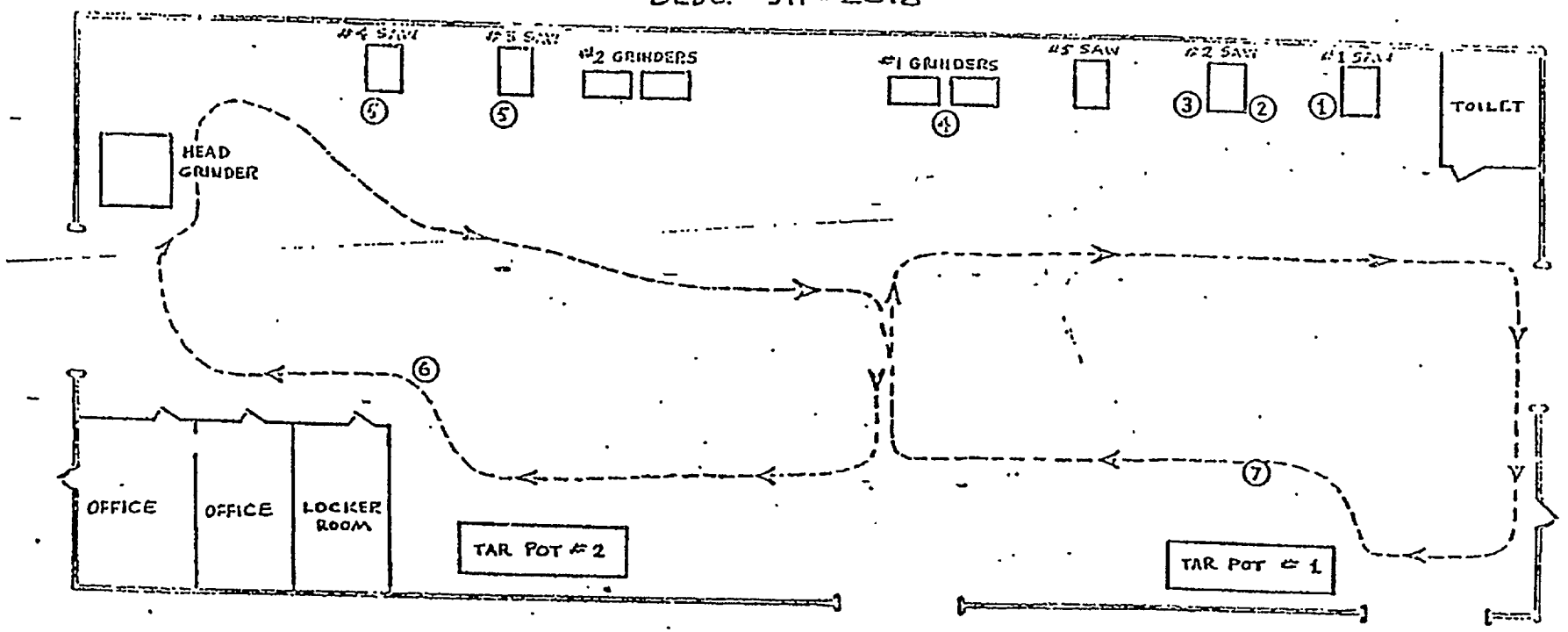
REP:gl

Union Carbide trial exhibit UC-5227: R. J. Sexton to S. C. Giambruno on the Insulation Block Dust Survey of Johns...
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FIGURE 1

INDUSTRIAL HYGIENE SURVEY

CONSTRUCTION INSULATION SHOP
BLDG 511 - 2018



① SAMPLING POINT AS "MITCHELL" SAWED BLOCKS
② SAMPLING POINT AS "BENNETT" WAS OFF BEARING ON #2 BAND SAW
③ SAMPLING POINT AS "RAINES" SAWED BLOCKS
④ SAMPLING POINT AS "DUNLOP" GROUND FIBER GLASS PIPE COVERS
⑤ SAMPLING POINT AS "SAMPLES" CUT RADIUS ON HEAD SEGMENTS
○ GENERAL ATMOSPHERIC SAMPLING AREA IN SOUTH END OF SHOP
⊙ GENERAL ATMOSPHERIC SAMPLING AREA IN NORTH END OF SHOP

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INDUSTRIAL HYGIENE SURVEY

EVALUATION OF ATMOSPHERIC DUST CONDITIONS AT THE CONSTRUCTION INSULATION SHOP

TABLE 1

Atmospheric Dust Concentration Data

As Collected with the Midget Impinger Pump & Apparatus

Type of Dust Material	SAMPLE No.	Location	Rate in cfm	Time in Min.	Vol. in C.F.	Blank # Particles	Dilution Factor	Count # Particles	Count in # per C.F.
Thermobestos	1	#1 Band Saw "Mitchell" while sawing	0.1	10.0	1.0	8.0	250	89.6	81.6
"	2	#2 Band Saw "Bennett" off bearing	0.1	10.0	1.0	8.0	250	105.4	24.5
"	3	#2 Band Saw "Raines" while sawing	0.1	10.0	1.0	8.0	625	51.4	102.4
"	4	#1 South Grinder "Dunlop" grinding fiber glass pipe covers	0.1	8.5	0.85	8.0	50	73.8	13.1
"	5	#4 Band Saw "Samples" sawing "Kaylo" head segments	0.1	10.0	1.0	8.0	50	71.4	13.1
"	6	G. A. (General Atmospheric) south end of Shop	0.1	10.0	1.0	8.0	20	37.8	2.4
"	7	G. A. North end of Shop	0.1	10.0	1.0	8.0	50	95.5	20.1
Kaylo	1	#1 Band Saw "Mitchell" while sawing.	0.1	10.0	1.0	5.2	20	37.2	3.04
"	2	#2 Band Saw "Bennett" off bearing	0.1	10.0	1.0	5.2	20	52.8	4.48
"	3	#2 Band Saw "Raines" while sawing	0.1	10.0	1.0	5.2	50	79.6	17.1
"	5	#3 Band Saw "Samples" cutting radius on head segments	0.1	10.0	1.0	5.2	20	59.6	7.68
"	6	G. A. South end of Shop	0.1	10.0	1.0	5.2	20	23.4	1.5
"	7	G. A. North end of Shop	0.1	10.0	1.0	5.2	20	45.0	3.92

TABLE 2

SUMMARY OF 40-HOUR WEEKLY WEIGHED EXPOSURES AS EXHIBITED BY FIVE WORKERS EMPLOYED AT BLDG. 511-2018

Worker*	Length of Exposure in Hours Per Week+			Concentrations in mppcf of Air		Weighted Exposure in mppcf
	To Both "Thermobestos" & "Kaylo"	To Only "Thermobestos"	To Only "Kaylo"	"Thermobestos"	"Kaylo"	
"Mitchell" (#1 Band Saw Ripping Blocks)	16.0	6.4	9.6	83.3	3.1	[illegible]
"Raines" (#2 Band Saw Ripping Blocks)	16.0	6.4	9.6	101.4	17.1	[illegible]
"Samples" (#3 & #4 Band Saws - Cutting Radius on Pad Segments)	16.0	6.4	9.6	13.1	7.7	[illegible]
"Bennett" (#2 Band Saw Off Bearing)	16.0	6.4	9.6	84.5	4.5	[illegible]
"Jordan" (#3 & #4 Band Saws Same as "Samples"		SAME AS SAMPLES				

* These workers were selected for identification upon the suggestion of the Shop Insulation Fabrication Foreman, Mr. D. R. Matheny, who stated that these particular men prove to be the ones most exposed to high concentrations of this air borne material known to the trade as "calcium silicate".

+ These hourly exposure values were derived on the basis of the following estimates also submitted by Mr. D. R. Matheny: 16 hours a week are probably spent working with both products (i.e., "Kaylo" and "Thermobestos") with about 40% of this being "Thermobestos" exposure and 60% "Kaylo" exposure.

The following general formula was used in deriving the values referred to above as weighed exposures:

$$\text{Weighed Exposure in mppcf of Air} = \frac{\left(\text{Concentration of "Thermobestos" in mppcf of Air}\right)\left(\text{Number Hours of Daily Exposure}\right) + \left(\text{Concentration of "Kaylo" in mppcf of Air}\right)\left(\text{Number Hours of Daily}\right)}{40 \text{ Hours Per Week}}$$

TABLE 3

"THERMODEDTOS" PARTICLE SIZE DISTRIBUTION USING BOTH

THE 43X & 97X OIL IMMERSION OBJECTIVES IN COMBINATION WITH A 12X FILAR EYEPIECE.

	43X OR 516 MAG. WHERE 1 FILAR DIV.≃ 0.2 MICRONS											97X OR 1164 MAG. WHERE 1 FILA. DIV.≃										
Micron → / WHOLE ↓	FRACTIONS											FRACTIONS										
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	TOTAL	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	TOTAL
0.0											1											
0.1																						
0.2																						
0.3																						
0.4												2										
0.5												7										
0.6												6										
0.7			1									13										
0.8	10										10	10										
0.9												9										
1.0	15		19		14		16		8		72	14	14	7	8	11	9	7	5	3	2	
2.0	10		9		10		12		6		47	3	4	5	4	3	1	2	1			
3.0	10		6		3		2		2		23	1	2	1	1		3	3				
4.0	2		3		1		6		3		15	4		3	1	1	2		2	3		
5.0	3		1		1		2		2		9	2			1	1						
6.0	2				2						4			1		1	1					
7.0	2		1						2		5				1			1				
8.0					1		2		1		4		1				1					
9.0	2		1				2		1		6	1										
10.0															1							
11.0			1				1				2											
12.0																						
13.0	1										1	1										
14.0																						
15.0														1								
16.0													1									
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18.0																						
19.0																						
20.0																						
21.0																						
22.0																						
23.0																						
24.0																						
25.0																						
26.0																						
27.0				1							1								1			1
Total											200											20

TABLE 4

"TAYLO" PARTICLE SIZE DISTRIBUTION USING BOTH

THE 43X & 97X OIL IMMERSION OBJECTIVES IN COMBINATION WITH A 12X FILAR EYEPIECE

	43X OR 516 MAG. WHERE 1 FILAR DIV. ≅ 0.2 MICRONS											97X OR 1164 MAG. WHERE 1 FILAR DIV. ≅ 0.1 OR 0.2										
Micron → / WHOLE ↓	FRACTIONS											FRACTIONS										
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	TOTAL	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	TOTAL
0.0																2						2
0.1																						
0.2																						
0.3												3										3
0.4	6										6	7										7
0.5												31										31
0.6	23										23	18		1	1							20
0.7												23										23
0.8	24										24	16										16
0.9												19										19
1.0	29		19		13		13		10		84	8	3	6	11	9	4	3	3	1	1	49
2.0	8		5		2		6		3		24	1	1	1		1				1	1	5
3.0	3		1		4		1		4		13				2							2
4.0	2		1		3				1		7		1	1		1			1			4
5.0	3						1				4		1							1		2
6.0							1		1		2		1									1
7.0	2										2	3		1								4
8.0																1						1
9.0					1						1						1					
10.0			2		1						3						1					1
11.0															1					1		2
12.0																			1			1
13.0							1				1						1					1
14.0									1		1											
15.0							1				1											
16.0			1								1											
17.0	1										1					1						1
18.0																						
19.0												1										1
20.0																						
21.0																						
22.0																						
23.0																						
24.0																						
25.0																						
26.0																						
27.0																			1			1
Total											200											200

TABLE 5

DETERMINATIONS OF THE PERCENTAGE CRYSTALLINE FREE SILICA PRESENT IN BOTH "THERMOBESTOS" & "KAYLO", AS QUARTZ, BY THE "TALVITIE" METHOD

"THERMOBESTOS"					"KAYLO"				
TRIALS	W_1 in GRAMS	W_2 in GRAMS	W_3 in GRAMS	% FREE SiO_2	TRIALS	W_1 in GRAMS	W_2 in GRAMS	W_3 in GRAMS	% FREE SiO_2
1	0.5002	0.0390	0.0069	6.42	1	0.5	0.0807	0.0433	7.48
2	0.5000	0.0347	0.0068	5.58	2	0.5	0.0730	0.0364	7.32
3	0.5002	0.0396	0.0082	6.28	3	0.5	0.0563	0.0190	7.46
Average % Crystalline Free SiO_2 = 6.4					Average % Crystalline Free SiO_2 = 7.4				

Determinations of the Percentage Crystalline Free Silica Present in Both "Thermobestos" & "Kaylo" by the X-ray Diffraction Method*

"Thermobestos"	"Kaylo"
2.5% ± 1%	5.6% ± 1%

*This information obtained and reported by Mr. K. J. Garska, Research and Development Department, Instrumental Methods Group, Union Carbide Chemicals Company.

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FIGURE 2

Cut-away Side View of a Band Saw With Ventilation Provided.

