1929
1929

Manville Chronology documents 1971–1976

list of Waukeegan plant employees etc.

1971 Health counseling part (1)

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CE100141969

[illegible]	(7)	[illegible]	(2)	File (2)
[illegible]	(7)	E. Ashmarent	(2)	
R. Harvell	(2)	Cees Tramth	(2)	
[illegible]	(2)	[illegible]	(2)	

[illegible]

[illegible] This is usually the result of lack of [illegible] or inability to recognize the hazard created by a fellow employee. [illegible] errors in judgment. Hidden hazards and man traps exist in every operation, and unless we recognize these situations we are gambling with life itself.

2. [illegible]: This is the fellow who knows but he does not care. This can be a temporary thing or a continuing attitude problem based upon how serious supervisors are about leadership in safety.

3. [illegible]: The short cut type. Their conditioned acts blind them to the hazards [illegible]. The [illegible] are dangerous. We have problems enough without [illegible] to worry [illegible].

4. [illegible]: [illegible] work day after day with poor work habits. [illegible] to train [illegible] he will become an accident victim because the [illegible] arrangements [illegible] to catch up to him.

5. [illegible]: [illegible] copy the example set by older employees who [illegible].

6. Laziness: This needs no explanation. We are all lazy; it is the degree that becomes critical.

7. [illegible]: This can be a permanent problem often related to the desire to get [illegible] done as fast as possible.

8. [illegible]: [illegible] factor to unsafe acts. Temper or impatience [illegible] control will usually lead to unsafe acts.

9. Physical Failure and [illegible] Employees in some cases commit unsafe acts because they are physically unfit. Such items as eyesight, hearing and general health are not too difficult to know about.

10. Lack of Training on Job. Here we have a big cause of unsafe acts. At the same time we have an easy one we can clean up. If we as supervisors do not satisfy ourselves that each employee under us knows how to do his job properly, then we fail in our jobs.

If we [illegible] unsafe acts from our operations, we will improve production, [illegible] and minimize [illegible].

J. V. Miles

1001460165

STRICTLY CONFIDENTIAL

Minutes of Meeting Held in J. E. Sheppard's Office on Wednesday Afternoon, August 6, 1947

Present at the meeting were:

Dr. A. J. Lanza
C. W. Hite
H. H. Jackson
J. R. Hamilton

NOTED V. B.

Hard Rubber Dust (See p. 2)

Dr. Lanza first reported on the case of Bishop McMillan, an employee at our Waukegan factory. He returned the file which had been sent to him on this case and pointed out, first, that he had noted that from September, 1944, until December, 1946, this individual had been a Rubber Mill operator, and that subsequent to December, 1946, he had been incapacitated for work.

Mr. Jackson confirmed the fact that the employee had been incapacitated ever since January 1, 1947.

Dr. Lanza commented that there was a considerable period in which the employee could not have been exposed to silica dust, and therefore he was a little surprised that he should leave the Rubber Mill, incapacitated. The history of the case showed that prior to starting work in the Rubber Mill in September, 1946, he had worked for the Company for a period of eight years from 1936.

Viewing one of the films, Dr. Lanza remarked that he couldn't understand what had got into this man's lungs, but the even distribution through both lung fields looked like an occupational case; yet, on the other hand, it didn't look to him like a typical silicotic film, unless it was one of the "queer ones" of which there have been quite a few lately.

Dr. Lanza said he will be interested in what Saranac has to report after examining the films but he added, "I would be inclined to exhaust the possibilities of silicosis in this case."

Looking at the films again, Dr. Lanza pointed out that in 1944 they showed nothing wrong, the individual having an average normal chest. This was at the time he left the Research Department and went to work in the Rubber Mill. The film showed that he had a little more fibrosis than normal; but this is a condition to be found in a great many "normal" people.

Looking at another film, Dr. Lanza said he was unable to understand how the man would get "that much silicosis in three years," (May, 1947). He added that this film showed that the man "has got a chest full of something; if it is silicosis, he developed it awfully fast." He remarked that his own experience had been that people of this race didn't do too well on silica dust.

Dr. Lanza recommended sending the films to Dr. Vorwald, at Saranac, for his examination and report.

He also suggested sending to Dr. Vorwald certain data from the file in question, specifically, Items 1, 2, 3, 4, and 6 from the memorandum from Waukegan of August 1, 1947. He also suggested sending a copy of Dr. Keller's medical report.

Dr. Lanza inquired whether Lavillan is sick now, and Mr. Jackson answered "yes," but said that at the moment he is back in the plant cleaning respirators. It is an assembling job at which he can sit down. Waukegan had reported over the telephone that he had come back to work only on Monday, August 4, and they had no idea how long he might continue working.

Dr. Lanza expressed the opinion that there wasn't anything to do in this case but to keep the man under observation and take another X-ray film in a month or so to see whether there has been any change in his condition. He added: "I don't know what he could have been exposed to in a Rubber Mill—perhaps heteregeneous dust, but not silica dust. But it doesn't add up to me. I would like to get further suggestions or a diagnosis of what they find up at Saranac. And I would watch him. You can't do anything at this time but see if this condition is going to clear up, remains the same, or is going to get worse."

Dr. Lanza pointed out again that the film taken in 1944 didn't show anything of a serious nature. Subsequent to that, the employee had worked in the Rubber Mill, so, his conclusion was, that whatever happened to him happened in the Rubber Mill. Both Mr. Hite and Mr. Jackson questioned him as to whether the man's exposure prior to that time could have reached some development stage during his employment in the Rubber Mill, i.e., could it have been in the primitive stages before September, 1944, and not progressed very far until after his employment in the Rubber Mill? Dr. Lanza disagreed with any such conclusion, saying that he had never seen such a thing happen.

Dr. Lanza is planning on going up to Saranac on August 15.

* * * * *

Dr. Lanza also reported on the work which Dr. Kenneth Lynch has recently completed from the notes and memoranda left by the late Dr. Roy U. Gardner. Dr. Lynch had sent him the report which he had worked up and Dr. Lanza thought it could be presented as an entity, as a Saranac report. He had sent it on to Dr. Vorwald, at Saranac, but the latter had written back to Dr. Lynch, with a carbon copy to Dr. Lanza, saying that he was reluctant to publish it because he is afraid that subsequent developments from Dr. Gardner's work might be at variance with the conclusions which Dr. Gardner arrived at in the report just put together. Personally, Dr. Lanza doubted this would be so, but, nevertheless, he conceded that Dr. Vorwald was entitled to his opinion.

Dr. Vorwald had expressed the hope in his letter to Dr. Lynch that he could get the latter's viewpoint on the opinion which he had raised about not publishing this data and he hoped it would be possible some time for Dr. Lynch to come up and see him at Saranac. Upon reading the carbon copy, Dr. Lanza thought this offered a good opening for him to talk to Dr. Lynch on the subject, so he had called him on the telephone and had a long talk with him. He suggested that Dr. Lynch might be able to go to Saranac about August 15 (when Dr. Lanza will be up there for a Trustees' meeting). Dr. Lynch had said he would like to go, but that he wouldn't know for another day or so whether he would be free to do so. Dr. Lanza said that if Dr. Lynch is not able to make the trip, he, Dr. Lanza, will have to "talk it through with Dr. Vorwald."

* * * * *

Dr. Lanza reported briefly on developments on the West Coast. He read a short letter which he had received from Dr. Smart, who thanked him for his letter of July 17, which, he said, had arrived just after Dr. Anderson and he had spent an afternoon together studying their proposed article. He also told Dr. Lanza that he had received written authorization from the Dicalite Company to go ahead; and he mentioned a similar authorization he had received from Mr. J. P. Woodard. Dr. Lanza remarked that the article being written by Drs. Anderson and Smart will be extremely timely and the status of this work is satisfactory.

* * * * *

Upon leaving the meeting, Dr. Lanza stated that he should know early next week whether or not Dr. Lynch will be able to visit Saranac. If he is not able to get away at that time, Dr. Lanza repeated that he himself will handle the matter of the "Asbestos Report" with Dr. Vorwald and see if he can resolve his doubts, because he, Dr. Lanza, was of the opinion that the report, as put together, will stand by itself, if Dr. Vorwald will release it. He promised to keep us informed of developments.

August 7, 1947

cc: Vandiver Brown

AL 103370052

April 25, 1949

To E. Turnbull - Room 922

Asbestos Pipe Covering

A survey was made on January 24, 1949 by the Industrial Health Section of the Metropolitan Life Insurance Company covering the use of perlite in the manufacture of asbestos pipe covering. The analysis of the samples taken indicates that dust counts were high for even a nuisance dust. The perlite had a free silica content of approximately 13.5% and on this basis the concentrations were considerably higher than the 20 million particles per cubic foot of air listed in the New Jersey State Department Health Code.

The free silica is apparently of an amorphous type since no crystalline forms were determined on microscopic examination. Amorphous silica, while not as harmful as the crystalline forms, cannot be considered innocuous and has been known to have caused lung damage. Tentative conclusions of the Harvard Organization who have conducted our research on diatomaceous earth confirm this.

It is my understanding that consideration is being given to the use of perlite in several of our productilines and I would recommend that adequate provision be made for ventilation and dust control in each such process.

H. M. Jackson

HMJ:LC
cc: A. Cromwell
L. Williams - Manville
W. L. Taylor - Manville
A. D. Cannon - Manville
F. W. Stanton - Manville

Medical File

CP.1004/H.2097

MINISTRY OF NATIONAL INSURANCE,

39 Bedford Square,

W.C.1.

Please address any reply on this subject to:
The Secretary
Our Reference S.162

6th November 1950.

Dear Dr. Lewis,

I have received your letter of October 26th, and I am very happy to help you. The Workmen's Compensation Acts in this country have been replaced by the National Insurance (Industrial Injuries) Act, 1946 which [illegible] Ministry of National Insurance. [illegible] Pneumoconiosis as meaning "fibrosis of the lungs due to silica dust, asbestos dust or other dust, and includes the condition of the lungs known as dust reticulation (Section 57 (3).

The National Insurance (Prescribed Diseases) Regulations, S.I.1948. No. 1911. para 24 (2) gives the Board power to have a radiographic examination of the lungs.

You will note that a radiological standard is not laid down equally for any form of pneumoconiosis. The standard of diagnosis is left to the members of the Pneumoconiosis Medical Boards who are full-time Medical Officers of the Ministry of National Insurance.

A pamphlet, Medical Notes on Pneumoconiosis, was prepared by this Ministry for the guidance of General Practitioners who may meet with cases of pneumoconiosis.

Please note that we say under diagnosis "The diagnosis of silicosis, as of all forms of pneumoconiosis, rests primarily on the X-ray findings". In fact no case of pneumoconiosis is diagnosed unless an X-ray examination is made. The difference between silicosis and pneumoconiosis is that we might find little clinical signs or symptoms in a silicotic with a chest radiographic diagnosis but in a case of asbestosis the radiographic changes might be slight compared with the clinical findings. This is explained in the pamphlet under "diagnosis" of asbestosis.

It is therefore not correct that workers are compensated for asbestosis on the findings of a clinical examination without X-ray and I personally would regard such a proceeding in exactly the same way as you do.

Yours sincerely,

/s/ Charles L. Sutherland

B 17-

1001460026

November 10, 1950

NOTED
V. B.

Vandiver Brown

Publication of Test Results - Saranac

In your memo of November 7, you mention the problem we have always had in connection with Saranac's publishing test data which we think should be kept confidential, at least for a longer period of time. I asked Dr. Lanza for some help on just what we could properly expect of Saranac and what agreement he thought would be appropriate.

Inasmuch as the Q. A. M. A. is about to enter into an arrangement with Saranac, the question is pertinent thereto.

Would you be kind enough to outline what you think would be a proper statement of agreement on this subject. For your information, the following is quoted from a blank agreement that I find in a file of material I got from Dr. Lanza a good many months ago:

> "4. Information to be furnished by The Donor or its affiliated companies to the staff of The Institute and results of The Institute's studies are confidential and The Institute will use its best efforts to see that such information is not disclosed, without The Donor's written consent, to persons other than those actually engaged in the investigations under this Agreement. It is appreciated that the results of such investigations may be of public and medical interest and it is understood that The University reserves the right to have members of The Institute publish the results of the experimental studies conducted by The Institute which are of public and medical interest, but that before any of the scientific results obtained in these studies are so published, a copy of the material to be published shall be submitted to The Donor at least thirty (30) days before publication for its comments or criticism. It is also understood and agreed that The Donor, or its affiliated companies will not be identified nor will proprietary names of its or their products be used in connection with such published results without The Donor's consent."

Maybe this will be of help.

J. P. Hoge

AL.1.0.3.4 0003

THE TRUDEAU FOUNDATION

FOR THE CLINICAL AND EXPERIMENTAL STUDY OF PULMONARY DISEASE

SARANAC LABORATORY
TRUDEAU LABORATORY
TRUDEAU SCHOOL

DEPARTMENT OF BIOCHEMISTRY
DEPARTMENT OF PHYSIOLOGY
DEPARTMENT OF RADIOLOGY

DEPARTMENT OF PHYSIOLOGY
TRUDEAU, N.Y.

January 8, 1951

Dr. Kenneth Smith
Canadian Johns-Manville Co., Ltd.
Asbestos, P.Q.

Dr. Paul Cartier
Thetford Industrial Clinic
Thetford Mines, P.Q.

Dear Ken and Paul:

In going over the cases we have studied I find that eight of the men who, to our belief, show insufficient X-ray evidence to warrant classification as definite asbestosis (by X-ray) nevertheless show pathologically incomplete saturation of their arterial blood during exercise. Although there is room for differences of opinion regarding the degree of alteration visible in the roentgenogram in some of these cases, nevertheless I believe we would all agree that the abnormalities are either very slight or non-existent. If it is established as a fact that the blood gases are abnormal at a time preceding unquestionable evidences of alteration by roentgenogram, the current importance of the roentgenogram for establishing the diagnosis of asbestosis is placed in a different light. The tremendous importance of checking our observations by repeat studies is obvious. This is all the more true because in certain instances we were having technical difficulty with the blood gas analysis at the time some of the men were examined.

We will repeat only the exercise blood gas study and can therefore finish two men each day. I would like to do this study prior to the Certificate one and am anxious to get on with both.

Sincerely yours,

George W. Wright, M.D.

gww:bld

Copies to:
Dr. Fernand Gregoire
Dr. Paul Cartier
Mr. Ivan Laberge

CM100541017

Confidential

General Headquarters
January 22, 1951

E. W. Smith, M. D. - Asbestos

Physical Examinations
Saranac

Dr. Lanza tells me he sent to you and to Mr. Saccaria a copy of the letter he received from Mr. Charles Sutherland, of London, about the reputed theory extant in England that a man can have asbestosis without its showing up in the X-ray of his lungs. Dr. Sutherland's letter said that no such claim is being held in England and that he, personally, would consider it entirely untenable.

Is there now such a theory in Quebec? If so, will you tell us what supports it and what could be done to disprove it, assuming it is incorrect.

In connection with this same subject, will you tell us when you expect a report from Dr. Wright on the tests that he made on the individuals at Saranac.

J. P. Woodford

cc: A. R. Fisher
E. V. Lindell, Asbestos
C. H. McCaw, Asbestos
M. M. Jackson

CM1005541021

Confidential

General Headquarters
February 10, 1951

K. K. Smith, M. D. - Asbestos

Physical Examinations - Canada
February 7

Apparently some of my letters on this subject have given impressions and have been the basis for inferences that were not intended. I regret deeply that this could have resulted from anything that I may have said or written on this subject.

The highlights of this situation as I recall them were about as follows:

(1) Through a letter or other communication, there was the information that Dr. Ballemere and his group claimed there could be disability from asbestosis without X-ray evidence and that this was accepted as a fact in England.

(2) This information was passed on to Dr. Lanza, who, on his own, wrote to Dr. Charles Sutherland, of London.

(3) Dr. Lanza later forwarded copies of Dr. Sutherland's reply to you and to others interested--I am not sure to whom.

(4) Mr. Fisher was interested in the Prochette case that brought up this subject and asked that we keep him advised of whatever information we might have of the outcome.

(5) My letters were to learn what seemed to be the development of opinion in Canada about the role X-ray evidence plays in determination of disability in asbestosis. Clearly, this is of great significance to us not only in Canada, but here in the States, as well.

The importance of your contributions toward the recognition of our hazards and the development of remedies for them is recognized by every one. If any different idea could have been inferred from anything I may have written, it did not represent either my thought or my intent.

J. P. Woodard

cc: A. P. Fisher
E. W. Lindell, Asbestos
C. H. McCaw, Asbestos
W. W. Jackson

CE10006 0109

NOTED
EMB
DJP
ALF
WPSB

May 28, 1953

Dr. K. W. Smith

Southern Pacific Railroad Company
Irritation and Silicosis due to Mineral Wool

Attached is letter from C. E. Bryant dated May 27th with enclosure from Thomas O'Leary, Jr. of Portland to Mr. Townsend, dated May 18th.

Although I have previously drafted similar letters I understand that your department now handles these matters and I am turning this file over to you for handling.

Arthur L. Fisk, Jr.

K
Enclosure
C. E. Bryant, Jr.

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OLS COPY

Waukegan
January 4, 1971
Page 1

H. M. Jackson - GHQ New York PO 91

RE: STANDARD PROCEDURE FOR WORK RESTRICTIONS AND COUNSELING OF PNEUMOCONIOSIS CASES

I appreciate yours and Cliff's desire to assist me in developing the proper format for the Manual of Standard Practices, however in reviewing the revised procedure as submitted in your letter of December 22, 1970 I find that very little of the original intent of the Standard Procedure is retained. For example one of the most striking features was your change from "Procedure for Work Restrictions and Counseling of Pneumoconiosis Cases" to that of "Procedure for Establishing Work Restrictions and Counseling Employees with Pulmonary Impairments". We are in fact talking about, and I think the standard should be specific, in stating pneumoconiosis cases. We are not talking about pulmonary impairment. I do not believe that there is any need to be ambiguous in this respect. Many of these cases, diagnosed sufficiently early, will not have any evidence of pulmonary impairment. They certainly are not to be confused with non-occupational diseases involving pulmonary impairment such as: emphysema, bronchiectasis, asthma, postoperative and posttraumatic lung changes, etc. We are talking about pulmonary fibrosis of occupational origin and I believe we must be specific in this regard.

I am most anxious to let the procedure as outlined in my letter of 10/29/70 to those locations that now have pneumoconiosis cases of record, be given a trial, as was approved by Mr. Burnett and the Policy Committee Task Force. Until proved otherwise, rather than embark on a totally new procedure, I would like to see a system with more than fifteen years of actual use and extremely satisfactory results, be given an opportunity of further success. Further, I am not persuaded that any great problem in advising employees of their diagnosis, after job approval is determined, will occur because of the lack of knowledge of actual job situations by the consulting physicians. More than 70% of all of our pneumoconiosis cases are at either the Manville or the Waukegan locations, where of course we have full time J-M physicians. If Toronto and Pittsburg locations are included, where well qualified part-time physicians who are quite familiar with problems, are available, then more than 78% of our cases are covered. Further, the advantage to the physician to be able to reassure the employee that although, he is a pneumoconiosis case, his prognosis based on no further exposure is optimistic, is of great value in the difficult duty of advising an employee/patient he has pneumoconiosis. However, more than this, the primary reason that this procedure was set forth in this sequence was that it alerted the employees supervision that the employee would be advised and therefore precluded the potentially difficult situation of an employee returning to his department following counseling and advising his supervision that a job change for him was indicated by the physician, without his department having any preparation for this information.

1-0

CONFIDENTIAL

Waukegan
January 4, 1971
Page 2 of 2.

RE: STANDARD PROCEDURE FOR WORK RESTRICTIONS AND COUNSELING OF PNEUMOCONIOSIS CASES

There are several other points in your suggested Standard Practices that I would like to comment upon. For one, in the counseling of the employees it is mentioned, "and review the employees chest x-ray with him". This I think should not be a specific part of the Standard Practice, but left entirely to the discretion of the physician involved with the counseling. Many will, as I have, find it is very helpful in advising the patient of his condition to use x-ray films. However, it must be recognized that perhaps somewhere between 95 & 99% of patients in general having x-ray films taken, never see their x-rays. It is not a common procedure with physicians to show patients their x-rays. In our situation it may be that the counseling physician does not in fact have the x-rays in his possession, but that they are on file at the local hospital, or in some other institution rather than in his office, or the company medical department. Next I would comment that putting in the Standard Practices that the physician will conduct his counseling in a manner that will assure that the employee understands his physical condition is unnecessary, it being understood that the physician will use whatever methods are appropriate to that particular patient, to acquaint that individual with his diagnosis.

I further believe that the formula for determining the acceptability of the employee/patient's job is far better set forth in the original suggestions that you made, that I incorporated in my recommendations of 10/29/70.

In summary it would be my desire Hugh, that we follow the original approval by Mr. Burnett in giving the proposed procedures a trial of actual usage to see what modifications should be made, if any. There is one immediate addition that I found quite practical and that is that as part of the physicians original implementation of restrictions, that he will indicate on that whether or not a respirator can be worn by the individual patient/employee in question. We will undoubtedly wish to have further discussions on this subject, however, I can only emphasis that I am particularly impressed with a system that has shown itself not only practical in application, but has resulted in a rapport between the company and the patient/employees significantly better than in most of our plant and mine locations since its implementation more than 15 years ago.

T. H. DAVISON, M.D.

File: S-19.2

1-0

FEB 22 1971

2/22

Manville Residential Products Plant
February 18, 1971

W. L. Ruff
J. R. Cran
J. A. Krochta
J. A. Stanley
C. H. Grote
A. W. Jung

STANDARD PROCEDURE FOR WORK RESTRICTIONS
AND COUNSELING OF PNEUMOCONIOSIS CASES
T. H. DAVISON'S LETTER OF OCTOBER 29, 1970

At a meeting held in the Manville Medical Department with Messrs. Jackson, Sheckler, Liss, Dantzig, Hemerda, and Anderson present, a review of the standard procedure for work restrictions and counseling of Pneumoconiosis cases was reviewed.

Dr. Davison has asked Dr. Liss and L. Hemerda to prepare their recommendations for incorporation into this procedure.

Several points were raised by the Manville personnel pointing out difficulties in implementing this procedure as written at the Manville location.

J. D. ANDERSON

cc: T. Davison, M.D. - Waukegan
H. Jackson - GHQ
C. Sheckler - GHQ

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CONFIDENTIAL

Hugh M. Jackson
General Headquarters

July 23, 1971

Re.: Incidence Study, Pneumoconiosis and Pleural Plaques,
Manville - Pinderne

Attached are the data compiled in our Department through review of our records.

Several explanatory notes are necessary:

(1) Most important is the fact that x-ray films themselves were not reviewed. This would be an effort of considerably different magnitude, but it is suggested that this be done by an expert in radiographic diagnosis, as the large peaks in the pneumoconiosis graph would, I'm certain, be eliminated (see #2).

(2) The large peaks in the pneumoconiosis graph in 1952, 1953, 1954, and 1969 correspond nicely to addition of new physician personnel in 1951, 1953 and 1969, as well as the lapse in number of x-ray studies done from 1963 to 1968.

(3) Pleural plaques are tabulated only if they occur without earlier pneumoconiosis. Pleural plaques occurring after pneumoconiosis are not included. When pleural plaques occur simultaneously with, or followed by, pneumoconiosis, they are included in each category within the respective year of diagnosis.

(4) As mentioned above, the data are derived from x-ray reports, often with some interpretation, by me, necessary for making a determination. This is obviously subject to some additional error. Pleural changes of undetermined etiology are not included, though it is certain a good number of these would be diagnosed as asbestosis were the films themselves, work history, etc., considered.

(5) "Length of service" is derived simply from the interval between first J-M hire and year of diagnosis; i.e., layoffs, leaves of absence, etc. are ignored.

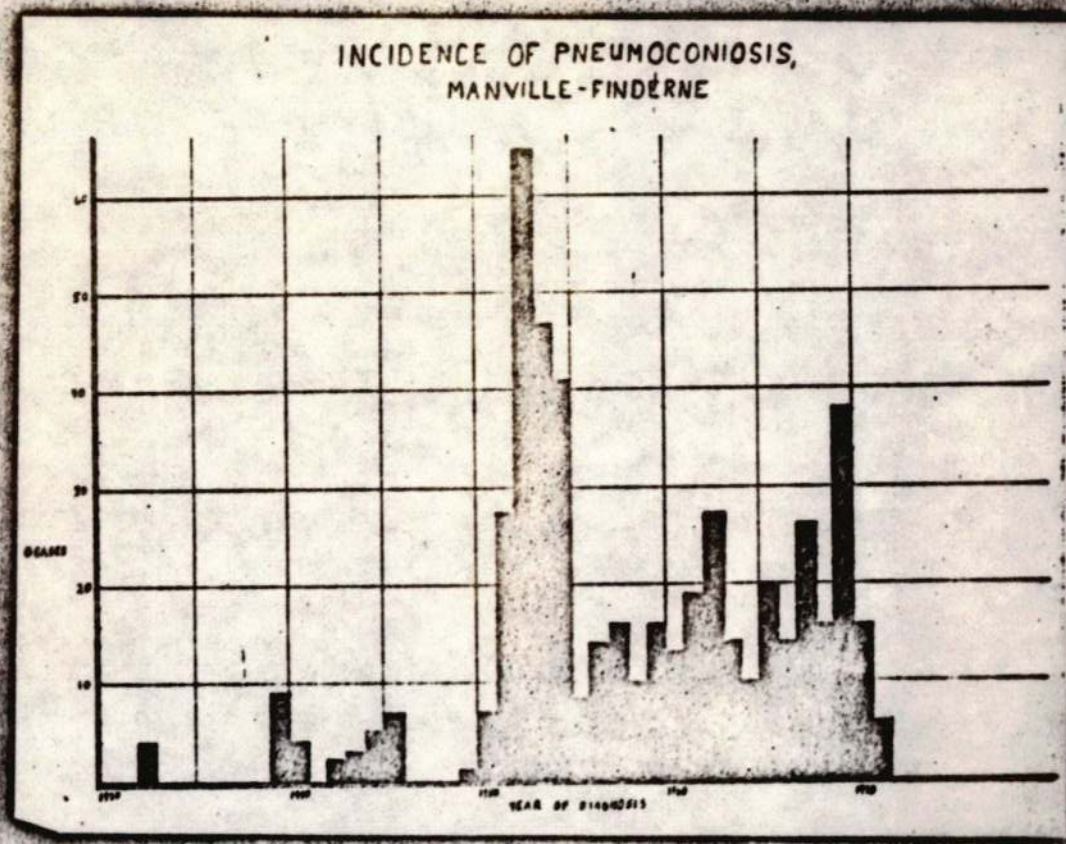
(6) When possible, x-ray changes attributable to non-J-M employment are not included.

R. P. Lisa, M.D.
Chief Medical Officer

RPL:th
c.c.: Dr. T. Davison
J. D. Anderson

AA 105

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INCIDENCE OF PNEUMOCONIOSIS, MANVILLE-PINDENE

Year of Dx	No. Cases	Lengths of Service (yrs.)
1932	4	12(3), 15
33	-	
34	-	
35	-	
36	-	
37	-	
38	-	
39	9	10(3), 11(2), 13, 15, 18, 21
1940	4	3(2), 13, 17
41	-	
42	2	23, 28
43	3	2, 14, 27
44	5	7, 9(2), 22, 34
45	7	4, 5, 8, 18, 22, 25, 36
46	-	
47	-	
48	-	
49	1	30
1950	7	14, 24(2), 30(2), 34(2)
51	27	4(2), 7(2), 8(2), 9(3), 10,11, 12, 14, 16, 21, 22(3), 26, 27, 28(3), 29, 33, 38, 39
52	65	4(2), 6(4), 7, 8, 9, 10(4), 11(4), 12(2), 15(2), 16(5), 17(6), 18, 19(4), 22, 23(4), 24(2), 25(2), 27(2), 28(2), 29(3), 30, 31(3), 32(2), 33, 34(2), 35, 37(2)
53	47	5, 6(3), 7, 10(2), 11(6), 12(3), 13(4), 14, 16(4), 17(2), 18, 20(3), 21, 23, 24, 25(2), 27(2), 28(2), 29, 30, 33, 34, 35, 37, 38
54	41	7(2), 8, 11(4), 12, 13(4), 14(4), 15, 17(4), 18, 19(2), 20, 21, 25, 27, 28(4), 29(2), 30, 32, 33, 34, 35, 37, 39
55	8	9(2), 18, 19, 26, 27, 29, 33
56	14	6, 8, 10, 15, 16, 19(2), 20, 21, 33, 34, 36, 38(2)
57	16	5, 6, 11(3), 16, 21(3), 22, 27, 30(2), 34, 36, 37
58	10	9, 11, 15, 16, 18, 22(2), 28(2), 29
59	16	12(2), 13(2), 14, 18, 19, 20, 23(2), 29, 34, 36, 40, 41, 43
1960	13	9, 12(2), 13, 14, 17, 24, 27, 30, 31(2), 36, 37
61	19	10, 11(2), 15, 18, 19(2), 23, 24, 26, 27, 29, 32, 33, 36, 37(2), 39, 49
62	27	4, 13, 15(3), 16(4), 21(5), 23, 25(2), 26(3), 27, 29, 35, 38, 42, 43, 48
63	14	12, 14, 15, 16, 20, 22(2), 25, 26, 27(2), 28, 34, 41
64	10	13(2), 14, 16, 18, 27, 28, 36(2), 37
65	20	9(2), 15, 16, 17(2), 18, 19(4), 23, 24(3), 26, 29, 30, 31, 38
66	14	11(2), 13, 15, 16(2), 18, 20, 25, 27, 30, 33(2), 43
67	26	14, 15, 20(2), 21(3), 22, 23(2), 24, 26(2), 28(2), 29, 31(2), 34(2), 38, 41(2), 42(2), 46
68	16	12, 15, 17, 18, 20, 22, 23, 25, 27, 28(2), 31, 32, 35(2), 43
69	38	14, 17(4), 22(8), 23(4), 24, 27(3), 28, 29(3), 30, 32, 33(2), 34, 36, 40(4), 41(2), 45
1970	14	15, 16, 20, 23(4), 24(2), 29, 30, 31(2), 33, 34, 42
71	6	17, 18, 20, 21, 24, 29
	505 TOTAL	

AA 105

INCIDENCE OF PLEURAL PLAQUES,

MANVILLE - FINDERNE

AA 105

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INCIDENCE OF PLEURAL PLAQUES, MANVILLE-PENDENNIS

Year of DX	No. Cases	Lengths of Service (yrs.)
1932	-	
33	-	
34	-	
35	-	
36	-	
37	-	
38	-	
39	-	
1940	-	
41	1	7
42	-	
43	-	
44	-	
45	-	
46	-	
47	-	
48	1	27
49	-	
1950	-	
51	2	18, 26
52	2	26
53	3	9, 13, 17
54	4	24, 30, 34, 35
55	4	29, 31, 32, 41
56	10	9, 20, 23, 26, 32, 33, 34(4)
57	3	35, 43, 45
58	7	14, 19, 22, 30(2), 36(2)
59	2	26, 34
1960	5	23, 27, 30, 31, 37
61	11	12, 14, 15, 24, 25, 26, 28, 36(3), 37
62	7	21, 25, 26(2), 29, 34, 39
63	3	26, 27(2)
64	4	22, 28, 41(2)
65	12	15, 18(2), 19, 23, 25, 26, 31, 34, 36, 37, 42
66	5	19, 24, 27, 29, 33
67	6	7, 20, 26, 27, 31, 39
68	12	20, 22, 23, 26(2), 27, 31, 32, 34, 35, 38, 58
69	27	10, 16, 17, 19, 21(2), 23(2), 24, 27(3), 28(2), 29, 30(2), 32, 33, 34(2), 35(3), 36(2), 41
1970	16	19, 23, 24(2), 28(3), 30(2), 31, 35(3), 38, 39, 45
71	2	40, 42
	148 TOTAL	

AA 105

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INFORMATION ON RED SLIP CASES

Waukegan Plant

	Name	Clock #	Dept.	Diagnosis	When Diagnosed	Informed
1.	Bay, Ivan	4004	250	Pneumoconiosis Stage I	7-27-45	7-27-49 ~~5-6~~
2.	Balderas, Ignacio	9120	070	Early Pneumoconiosis	6-6-47	6-23-60
3.	Rieto, Margarito	7294	440	Pneumoconiosis Minimal	5-26-48	8-17-60
4.	Jellings, James	4036	917	Early Pneumoconiosis	4-7-48	11-18-54
5.	Bartola, Tony	3378	070	Mixed Pneumoconiosis	2-1949	In T.B. San 1953
6.	Taylor, Douglas B.	9110	070	Asbestosis Early Stage I	4-14-49	11-16-54
7.	Raper, Wesley	9138	070	Pneumoconiosis Stae I	12-1-49	10-1-56
8.	Luna, Ray	9212	070	Early Pneumoconiosis	11-14-49	8-2-55
9.	Anthony Clarence	3132	180	Pneumoconiosis Stage I	8-9-49	9-30-55
10.	Castillo, Ricardo	8142	450	Early Pneumoconiosis	1949	6-7-55
11.	Christian, Rubert	929	250	Pneumoconiosis Stage II	1949	9-15-54
12.	Picard, Alex	Salary	070	Pneumoconiosis Stage I	10-26-50	1-5-55
13.	Faulkner, Ray	4037	250	Mixed Pneumoconiosis Stage I	4-3-50	10-23-56
14.	Byrnes, Jessie	1498	310	Pneumoconiosis Stage I	9-30-50	10-23-54
15.	Perez, Julian	7295	440	Early Pneumoconiosis	1-24-51	3-9-56
16.	Arnold, Horace	4022	250	Mixed Asbestosis Stage II	2-13-52	5-23-55
17.	Meisenheimer, Richard	1507	250	Pneumoconiosis Mixed Stage I	5-15-52	10-2-56
18.	Wysiatko, Thomas	4052	250	Asbestosis Stage I	1952	1-23-56
19.	Cole, William	6119	410	Pneumoconiosis Stage I	2-29-52	2-22-56
20.	Pierman, Paul	7232	165	Pneumoconiosis Stage I	12-18-51	1-24-56
21.	Richards, Lester	4068	917	Asbestosis Stage I	10-23-52	7-20-60
22.	Pfennfelker, Ernest	6506	380	Asbestosis Stage I	11-12-52	9-14-55
23.	Zbinden, Ortie	8355	250	Asbestosis Stage I	5-12-52	1-23-56
24.	Bailey, Thomas	4016	250	Asbestosis Stage I	5-7-52	1-23-56
25.	Russell, Gene	7021	440	Pneumoconiosis Stage I	1-22-53	7-27-56
26.	Gray, Francis	Salary	190	Pneumoconiosis Stage I	12-1953	1-11-55
27.	Dever, Harry	9151	070	Pneumoconiosis Stage II	5-26-54	9-14-55
28.	Mienke, Wesley	9121	160	Pneumoconiosis Stage I	2-2-54	11-25-57
29.	Kendich, Mike	1438	310	Pneumoconiosis Stage I	9-20-54	11-16-56
30.	Cobb, Andrew	5232	910	Mixed Pneumoconiosis Stage I	3-22-54	6-22-56
31.	Brackett, Thomas	1330	250	Mixed Pneumoconiosis Stage I	12-28-54	1-4-56
32.	Davis, Silas	4086	250	Pneumoconiosis Stage I	1-28-54	12-12-55
* 33.	Wendlandt, Edgar	5051	740	Probable Early Pneumoconiosis	7-22-54	9-22-55
34.	Dermageorian, Hagop	3508	190	Early to Ecderate Pneumoconiosis	8-19-54	1-9-57
35.	Grose, Willie	5111	130	Mixed Pneumoconiosis Stage I	11-2-54	10-26-60
36.	Swanson, Ray	Salary	070	Pneumoconiosis Stage I	8-4-54	9-12-55
37.	Madson, Ray	7811	440	Asbestosis Stage I	8-31-54	3-29-57
38.	Kabaret, Stephen	Salary	070	Pneumoconiosis Stage I	7-8-54	8-31-55
39.	Vega, Emilio	7816	750	Pneumoconiosis Stage I	7-21-54	7-18-55

INFORMATION ON "RED SLIP" CASES - Continued

Waukegan Plant

	Name	Clock #	Dept.	Diagnosis	When Diagnosed	Informed
40.	Schasane, Francis	7309	440	Pneumoconiosis Stage I	5-20-54	9-22-55
41.	Merold, James	1255	410	Asbestosis Stage I	12-29-54	1-3-61
42.	Richards, Wallace	4131	740	Asbestosis, Stage I	9-20-54	10-14-55
43.	Turner, Roy	4029	162	Early Pneumoconiosis	3-9-54	6-25-56
44.	Hatley, Jessie	4522	250	Pneumoconiosis Stage I	12-28-54	1-4-56
45.	Schettler, Richard	6413	410	Pneumoconiosis Stage I	3-12-54	10-24-54
46.	Copeland, Elijah	1519	310	Asbestosis Stage I	1-30-55	8-11-60
47.	Sheldon, Benjamin	4077	250	Asbestosis Stage I	1-6-55	9-8-55
48.	Basten, William	Salary	250	Pneumoconiosis Stage I	6-14-55	12-4-59
49.	Sander, Fred	4137	250	Asbestosis Stage I	1-11-55	11-11-55
50.	Aikens, Benjamin	921	230	Pneumoconiosis (Asbestosis) Stage I	9-20-55	1-22-57
51.	Dalton, Loyal	7390	310	Pneumoconiosis Stage I	10-18-55	10-18-55
52.	Lundeen, Vincent	4089	250	Asbestosis Stage I	1-12-55	9-20-55
53.	Savaglio, Chester	9118	740	Pneumoconiosis Stage I	5-3-55	5-8-57
54.	Peterson, Cecil	9217	070	Asbestosis Stage	8-14-56	6-24-60
55.	Kieffner, Elmer	5695	740	Pneumoconiosis Stage I	11-23-56	3-8-60
56.	Kataran, George	4352	250	Pneumoconiosis Stage I	9-24-58	8-2-60
57.	Bricco, Robert	11825	070	Pneumoconiosis Mixed Stage I	2-4-58	4-20-60
58.	Kinsey, Edward	7806	440	Mixed Pneumoconiosis Stage II	5-14-58	5-20-60
59.	Koschalk, Frank	4152	250	Mixed Pneumoconiosis	9-9-58	8-16-60
60.	Paul, Ralph	Salary	390	Asbestosis Stage I	4-9-58	5-31-60
61.	Eubanks, Lloyd	3719	191	Mixed Pneumoconiosis	5-14-58	8-15-60
D. 62.	Burnheimer, Kenneth	9293	070	Mixed Pneumoconiosis StageI	9-16-58	8-29-60
63.	Berent, Clarence	7101	440	Mixed Pneumoconiosis StageI	11-11-58	12-15-58
64.	Moses, James	18263	250	Mixed Pneumoconiosis StageI	9-24-58	12-14-59
65.	Rosenthal, Rudolph	7106	440	[illegible]	9-10-58	8-23-60
66.	Hall, Earl	14253	070	Asbestosis Stage I	5-11-59	At T.B. San 1959
67.	Limbert, Monte	10513	070	Pneumoconiosis Stage I	8-25-60	12-20-60
68.	Brandt, Charles	2387	070	Mixed Pneumoconiosis Stage I	11-7-60	12-20-60
69.	Vines, Roy	7300	250	Mixed Pneumoconiosis Stage I	12-5-60	11-7-61
70.	Lopez, Carmen	7291	440	Mixed Pneumoconiosis Stage I	11-29-60	4-3-61
71.	Pierce, Dennis	11196	250	[illegible]	2-16-61	11-8-61
72.	Miller, Willis	4025	250	Mixed Pneumoconiosis Stage I	12-1-61	6-20-62
73.	Carlisle, Frank	942	440	P.M. - II Asbestosis	9-15-61	11-13-61
74.	Britton, Guy	4074	917	Mixed Pneumoconiosis	2-27-61	9-29-61
75.	Harris, Willian	5575	250	Mixed Early Pneumoconiosis	9-1-61	2-20-63
76.	Sjolund, James	Salary	162	Mixed Pneumoconiosis	9-19-61	12-5-61
77.	Skofstad, Gordon	Salary	111	Mixed Pneumoconiosis StageI	8-25-61	7-29-63
78.	Mack, Frank	0755	072	Pneumoconiosis Stage I	2-7-62	11-6-62
79.	Otts, Cecil	11022	070	Early Pneumoconiosis Stage I	12-7-61	8-8-62
80.	Krause, Delbert	7507	390	Pneumoconiosis Stage I	3-2-62	11-21-62 & 6-7-62
81.	Zabinski, John	4361	250	Pneumoconiosis Stage I	7-7-62	8-25-62

INFORMATION ON "RED SLIP" CASES - Continued
Waukegan Plant

Name	clock #	Dept.	Diagnosis	When Diagnosed	When Informed
82. Hauser, Frank	5442	840	M1	8-15-62	10-15-63
83. Grice, Ernest	11686	840	M1	8-10-62	9-11-62
84. Ochoa, Ignacio	7267	072	Pneumoconiosis Stage I	7-18-62	1-30-63
85. Walter, Donald	9193	070	Mixed Pneumoconiosis Stage I	7-18-62	1-22-63
86. Funk, Lloyd	Salary	250	Mixed Pneumoconiosis Stage I	3-2-62	7-24-63
87. Hillson, Elmer	4392	660	Mixed Pneumoconiosis	3-27-62	4-27-63
88. Frausto, Flaranty	9632	070	Mixed Pneumoconiosis Stage I	2-20-62	6-12-62
89. Cardinal, Thomas	9561	070	Mixed Pneumoconiosis Stage I	6-13-62	5-22-63
90. George, Walter	9113	840	Mixed Pneumoconiosis Stage I	6-19-62	6-9-63
91. Leginsky, Frank	6152	917	Early Mixed Pneumoconiosis, Stage I	8-9-62	10-22-63
92. Pombolis, Peter	7262	740	Early Mixed Pneumoconiosis	1-22-62	6-18-62
93. Brock, Charles	5376	914	M1	6-15-62	6-20-63
94. Childress, James	14926	640	Mixed Pneumoconiosis Stage II	4-12-62	5-24-63
95. Dobrinska, Eugene	12757	390	Early Pneumoconiosis M1	4-10-62	6-22-64
96. Flamme, Fred	13362	740	Early Pneumoconosis	1-30-62	3-15-63
97. Harris, Jewell	13518	250	Early Pneumoconiosis M1	7-1-62	5-23-63
98. Willard, Clyde	9684	070	M1 with probable inactive TB Rt. apex	7-1962	At TB San 12-1962
99. Villani, Filippo	5119	740	M1	3-2-62	9-4-63
100. Larson, Morris	14908	660	M1	6-14-62	7-1-63
101. Graeff, Roger	11939	310	Early Mixed Pneumoconiosis	10-29-62	10-21-63
102. Ackerman, Henry	7891	740	M1	8-14-62	10-16-63
103. Mitrikeff, Victor	5576	640	M1	4-5-62	4-17-63
104. Nord, Alton	Salary	230	M1	7-2-62	2-21-63
105. Pauley, Melvin	Salary	380	M1	8-9-62	2-25-63
106. Velasco, Albert	8122	450	Early Mixed Pneumoconiosis	11-20-62	5-8-63
107. Wrona, Eugene	Salary	740	M1	7-13-62	8-12-63
~~108. Cox, Theodore~~	~~15318~~	~~250~~	~~M1~~	~~4-5-62~~	~~9-30-63~~
109. Hirschler, John	Salary	240	Early Pneumoconiosis	5-22-63	7-30-64
110. Holland, Robert	17897	250	Mixed Pneumoconiosis Stage I	6-15-63	9-17-63
111. Dick, John	9520	070	Early Mixed Pneumoconiosis	1-30-64	7-8-64
112. Bosnak, Henry	Salary	380	Mixed Early Pneumoconiosis Stage I	3-4-64	7-14-64
113. Cummings, Willie	1062	660	Early Mixed Pneumoconiosis	11-21-64	9-8-65
114. Lewis, Elijah	16330	230	Early Mixed Pneumoconiosis	2-20-64	6-23-64
115. Thompson, Hugo	Salary	370	Early Mixed Pneumoconiosis	5-11-66	5-20-67
116. Fleming, Ulysses	Salary	250	Early Pneumoconiosis - M1	9-15-66	6-23-66

INFORMATION ON "RED SLIP" CASES - Continued
Waukegan Plant

Name	Clock #	Dept.	Diagnosis	When Diagnosed	Informed
117. Rytie, Roy	9094	390	Early Mixed Pneumoconiosis Stage I	5-13-66	6-13-67
118. Drost, Lester	Salary	070	Early Mixed Pneumosoniosis Stage I	6-30-66	7-6-67
119. Cardinal, Eugene	5579	640	Mixed Pneumoconiosis Stage I	12-23-66	6-28-67
120. Obrenovich, George	21835	310	Mixed Pneumoconiosis Early, Stage I	10-24-66	3-15-68
121. Sunday, Earl	Salary	830	Early Mixed Pneumoconiosis Stage I	9-20-66	10-16-67
122. Tessin, Floyd	15409	070	Early Mixed Pneumoconiosis Stage I	9-22-66	10-26-67
123. Jakomovich, William	9768	070	Early Mixed Pneumoconiosis Stage I	8-9-66	8-31-66
124. Petkovsek, Stanley	7514	390	Early Mixed Pneumoconiosis Stage I	3-16-66	10-5-66
125. Pierce, Ralph	230	916	Asbestosis Stage I	12-14-67	3-13-68
126. Estes, Robert	22364	070	Early Mixed Pneumoconiosis Stage I	10-26-67	7-23-68
*127. Ladewig, Emery	16076	860	Mixed Pneumoconiosis	1-12-67	3-18-68
128. Baker, Chester	7452	760	Early Mixed Pneumoconiosis Stage I	11-14-67	3-12-68
129. Keeton, Archie	6323	390	Asbestosis Stage I	11-15-67	3-21-68
130. Tsimic, Larry	Salary	250	M1	10-16-67	10-31-67
131. Wicketts, Clarence	5554	840	M1	4-26-67	6-5-67
132. Allen, Leon	1501	310	Pneumoconiosis, M1 Stage I	12-6-67	5-16-68
133. Danielson, Delbert	1037	640	Mixed Pneumoconiosis Stage I	10-10-68	11-12-68
134. Gray, William	Salary	760	Asbestosis Stage I	10-30-68	11-5-68
135. Cenni, Florindo	5556	840	Early Mixed Pneumoconiosis	3-15-68	4-11-68
136. Watkins, Paul	21892	280	Mixed Pneumoconiosis Stage I	7-25-68	8-4-68
137. Johnson, Vincent	Salary	830	Mixed Pneumoconiosis Stage I	1-22-68	1-31-68
138. Medina, Joseph	7244	760	Early Mixed Pneumoconiosis M1	6-27-68	9-3-68
139. Florio, Charles	Salary	830	Mixed Pneumoconiosis Stage I	10-31-68	11-20-68
140. Chesney, Edward	Salary	290	Mixed Pneumoconiosis Stage I	11-1-68	4-2-69
141. Dvorak, Barney	2800	111	Pneumoconiosis, A1	10-4-68	11-4-68
142. Cameron, Lyle	22172	070	Early Mixed Pneumoconiosis Stage I	7-31-68	8-28-68
143. Crabb, Oscar	21326	911	Early Mixed Pneumoconiosis	5-15-68	8-27-68
144. Pastell, Vernon	5562	740	Asbestosis Stage I-II	12-5-69	8-3-70
145. Ray, Paul	19516	070	Early Mixed Pneumoconiosis Stage I	5-26-69	7-2-69

Name	Clock #	Dept.	Diagnosis	When Diagnosed	Informed
146. Cole, John	12610	161	Early Mixed Pneumoconiosis Stage I	3-25-69	4-29-69
147. Thibedeau, Lawrence	7545	390	Early Mixed Pneumoconiosis Stage I	3-20-69	5-1-69
148. Bernard, William	150	250	Asbestosis, Stage II	3-4-70	3-23-70
149. McKim, James	9534	070	Mixed Pneumoconiosis Stage I	3-19-70	4-14-70
150. Sparks, Arthur	21693	070	Mixed Pneumoconiosis Stage I	3-6-70	4-8-70
151. Kantola, Carl	4005	250	Asbestosis, Stage I	5-22-70	7-17-70
152. Gilstead, Lloyd	9139	070	Early Mixed Pneumoconiosis	5-22-70	7-30-70
153. Burchfield, Leonard	14725	070	Mixed Pneumoconiosis	2-4-70	3-10-70
154. Scott, Lenard	9737	250	Mixed Pneumoconiosis Stage I-II	3-6-70	4-7-70
155. Montgomery, Lesby	3107	150	Asbestosis Stage I-II	3-31-70	9-30-70
156. Petty, William	16420	310	Mixed Pneumoconiosis Stage I	6-10-70	9-17-70
157. Faulkner, Frank	2569	740	Pneumoconiosis, Stage 0-I	6-4-70	8-11-70
158. Fasse, Marvin	3642	190	Pneumoconiosis Stage 0-I	3-12-70	4-9-70
159. Hoem, John	Salary	190	Mixed Pneumoconiosis	3-3-70	3-18-70
160. Poore, Hubert	Salary	070	Mixed Pneumoconiosis	4-2-70	4-6-70
161. Draudt, Lawrence	5	917	Pneumoconiosis - Stage I Asbestosis Presumed	2-20-70	3-5-70
162. Snelling, Mark	8116	457	Asbestosis Stage I	9-10-70	10-28-70
163. Higgins, Homan	3854	161	Mixed Pneumoconiosis Stage I	3-19-70	10-8-70
164. Godsey, Elzo	21611	250	Asbestosis, Stage I	12-7-70	12-15-70
165. King, Merrill	4090	070	[illegible]	3-12-70	4-6-70
166. McNutt, Edsel	Salary	820	[illegible]	4-7-70	11-24-70
167. Collier, Lawton	21717	070	[illegible]	2-25-71	4-26-71
168. Belivean, Lionel	Salary	810	Pneumoconiosis Stage 0-I	3-30-71	5-14-71
169. Price, Arthur	Salary	954	Asbestosis Stage II	1-26-71	5-7-71
170. Jablonski, Charles	7887	440	Pneumoconiosis Stage I	5-12-62	2-15-63
171. Stanley Mesec	Salary	740	Pneumoconiosis .	9-20-71	10-12-71
172. Harold Goldwitzer	4001	250	Pneumoconiosis Stage I	10-7-71	10-28-71
173. Eugene Hughes	4139	250	Pneumoconiosis Stage 0-I	10-25-71	- - -
174. Walter Long	404	070	Asbestosis Stage I	6-25-70	7-28-70

** - Wasilewski, Edward - Mesothelioma - 1971
** - Emery Ladewig - Mesothelioma - 1971

May, 1971

Summerford, Clarence - Mesothelioma - 1971

CC: T. E. Davison, M.D.
R. F. Winkworth
E. M. Jackson
Medical Dept.

CONFIDENTIAL

Waukegan
May 7, 1971

J. Nell - Billerica Plant
F. Chapman - Billerica Plant

PERIODIC PHYSICAL EXAMINATION PROGRAM BILLERICA PLANT -
DR. GAENSLER, BOSTON UNIVERSITY

As per our telphone conversation of 4/30/71, Dr. Gaensler's protocol and estimated cost for this program are satisfactory and implementation of the program should be made at the earliest possible date. It is recognized that the target date suggested by him of May 7 will not be attainable however. Dr. Gaensler is being advised that you will be contacting him regarding a suitable starting date, plus daily and hourly schedules for the examinations.

He is also being advised regarding his questions. Patient releases for information regarding the results of the examination, possible requests for information from patient/employee's attorneys, or requests of information from compensation boards. I am advising Dr. Gaensler that it is my opinion that these examinations be considered as any other medical consultation requested and paid for by the company and therefore the release for information from the patient/employee is not necessary and that information requested by attorneys and compensation boards will be handled as in any other such case. That is, such requests to Dr. Gaensler or his staff will be referred to the company for their appropriate action. I have further advised him that reports of positive findings to the patient/employee's private physician are considered both appropriate and desirable. I have also indicted to Dr. Gaensler that pursuant company policy and in conformity with the Occupational Safety & Health Act of 1970 that our plant physician, namely Dr. Woo, will be counseling employees with positive findings as determined by Dr. Gaensler's reports.

It is my suggestion that sometime early in the program arrangements be made for Dr. Woo to have the opportunity to meet and discuss this aspect of the program with Dr. Gaensler.

Please advise me of the date when this program is to be initiated and the schedule that you elect.

THOMAS H. DAVISON, M.D.

cc:
M. W. Burleson - GH, New Yor PO 91
W. P. Kuhn - GH, New York PO 91
A. B. Marchant - GH, New York PO 91
M. M. Jackson - GH, New York PO 91
C. L. Sneckler - GH, New York PO 91

AVA 0707

TAC 0 86 2530

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To be a valid assay, the percent column recovery should be 100±2 percent.

(6) *Identity.* Proceed as directed in § 141.521 of this chapter, using a 0.5 percent potassium bromide disc prepared as described in paragraph (b)(1) of that section.

(7) *Crystallinity.* Proceed as directed in § 141.504(a) of this chapter.

§ 150g.11 Minocycline hydrochloride capsules.

(a) *Requirements for certification—*(1) *Standards of identity, strength, quality, and purity.* Minocycline hydrochloride capsules are composed of minocycline hydrochloride and one or more suitable and harmless lubricants and diluents enclosed in a gelatin capsule. Each capsule contains minocycline hydrochloride equivalent to 100 milligrams of minocycline. Its potency is satisfactory if it is not less than 90 percent and not more than 115 percent of the number of milligrams of minocycline that it is represented to contain. Its moisture content is not more than 12 percent. The minocycline hydrochloride used conforms to the standards prescribed by § 150g.1(a)(1).

(2) *Labeling.* It shall be labeled in accordance with the requirements of § 148.3 of this chapter.

(3) *Requests for certification; samples.* In addition to complying with the requirements of § 146.2 of this chapter, each such request shall contain:

(i) Results of tests and assays on:

(a) The minocycline hydrochloride used in making the batch for potency, safety, moisture, pH, minocycline content, identity, and crystallinity.

(b) The batch for potency and moisture.

(ii) Samples required:

(a) The minocycline hydrochloride used in making the batch: 10 packages, each containing approximately 300 milligrams.

(b) The batch: A minimum of 30 capsules.

(b) *Tests and methods of assay—*(1) *Potency.* Proceed as directed in § 141.111 of this chapter, preparing the sample for assay as follows: Place a representative number of capsules into a high-speed glass blender jar with sufficient 0.1*N* hydrochloric acid to give a stock solution of convenient concentration containing not less than 150 micrograms of minocycline per milliliter (estimated). Blend for 3 to 5 minutes. Remove an aliquot and further dilute with 0.1*M* potassium phosphate buffer, pH 4.5 (solution 4), to the reference concentration of 0.100 microgram of minocycline per milliliter (estimated).

(2) *Moisture.* Proceed as directed in § 141.502 of this chapter.

Data supplied by the manufacturer concerning the subject antibiotic have been evaluated. Since the conditions prerequisite to providing for its certification have been complied with and since not delaying in so providing is in the public interest, notice and public procedure and delayed effective date are not prerequisites to this promulgation.

Effective date. This order shall be effective upon publication in the FEDERAL REGISTER (12–7–71).

(Sec. 507, 59 Stat. 463, as amended; 21 U.S.C. 357)

Dated: November 21, 1971.

H. E. SIMMONS,
Director, Bureau of Drugs.

[FR Doc.71–17773 Filed 12–6–71;8:45 am]

Title 29—LABOR

Chapter XIII—Bureau of Labor Standards, Department of Labor

PART 1518—SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

Standard for Exposure to Asbestos Dust

Pursuant to section 4(b)(2) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1592, 29 U.S.C. 653), § 1518.55 of Title 29, Code of Federal Regulations, is hereby amended in the manner indicated below in order to prescribe a new standard limiting the exposure of workers to asbestos dust. The new standard limiting the exposure of employees to asbestos dust is that adopted under section 6(c) of the Williams-Steiger Occupational Safety and Health Act of 1970 and published in the FEDERAL REGISTER on this date. The standard is hereby determined to be more effective than that presently provided under § 1518.55 to the extent that it prescribes minimum levels of exposure to asbestos dust. Therefore, by operation of section 4(b)(2) of the Act the new standard issued under section 6(c) supersedes the construction safety standard relating to exposure to asbestos dust.

Section 1518.55 is hereby amended by adding a new paragraph (c) thereto. As amended § 1518.55 reads as follows:

§ 1518.55 Gases, vapors, fumes, dusts, and mists.

* * * * *

(c) Paragraphs (a) and (b) of this section do not apply to the exposure of employees to airborne asbestos dust. Whenever any employee is exposed to airborne asbestos dust, the requirements of § 1910.93a of this title shall apply.

Effective date. This amendment shall become effective upon publication in the FEDERAL REGISTER (12–7–71).

(Sec. 4(b)(2), 84 Stat. 1592, 29 U.S.C. 653; Secretary's Order No. 12–71, 36 F.R. 8754)

Signed at Washington, D.C., this 2d day of December 1971.

G. C. GUENTHER,
Assistant Secretary of Labor.

[FR Doc.71–17835 Filed 12–6–71;8:47 am]

Chapter XVII—Occupational Safety and Health Administration, Department of Labor

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Emergency Standard for Exposure to Asbestos Dust

Pursuant to section 6(c) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1596, 29 U.S.C. 655), Part 1910 of Title 29, Code of Federal Regulations (36 F.R. 10466, May 29, 1971) is hereby amended in the manner indicated below in order to provide an emergency standard dealing with the exposure of employees to asbestos dust.

In light of increasing information on the results of exposure of employees to airborne asbestos dust, including recent studies by the National Institute for Occupational Safety and Health and others, and recommendations by the American Conference of Governmental Industrial Hygienists (ACGIH), it is hereby determined that (1) exposure under the present standard for asbestos dust in Table G–3, § 1910.93, of 12 fibers per milliliter greater than 5 microns in length or 2 million particles per cubic foot of air, which is derived from an established Federal standard promulgated under the Walsh-Healey Public Contracts Act on May 20, 1969, constitutes a grave danger to employees exposed to this 8-hour time-weighted average concentration; and that (2) an emergency standard is necessary to protect employees from this excessive exposure. The National Institute for Occupational Safety and Health concurs that the proposed change in the asbestos dust standard recommended by the American Conference of Governmental Industrial Hygienists should be the substantial base for the emergency standard.

Action concerning the standard will be commenced under section 6(b) in the immediate future. Any notice of proposed rulemaking under section 6(b) will give notice of the emergency standard as a proposed rule and also of any appropriate subsidiary proposals which may be required under subparagraphs (5) and (7) of section 6(b) relating to the exposure of employees to toxic substances.

Part 1910 is amended as follows:

1. Table G–3 following § 1910.93 (36 F.R. 15104, Aug. 13, 1971) is hereby amended by deleting the following:

Asbestos—12 fibers per milliliter greater than 5 microns in length or	2 Mppcf.
Tremolite	5 Mppcf.

20mg./M³
% SiO_2

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As amended, Table G–2 reads as follows:

TABLE G–2—MINERAL DUSTS

Substance	Mppcf [a]	Mg/M³ [b]
Silica:		
Crystalline:		
Quartz (respirable)	250 [c]	10mg/M³ [d]
	%SiO₂+5	%SiO₂+2
Quartz (total dust)		30mg/M³
		%SiO₂+2
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	80mg/M³
		%SiO₂
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc	20	
Portland cement	50	
Graphite (natural)	15	
Coal dust (respirable fraction less than 5% SiO₂)		2.4mg/M³ or
For more than 5% SiO₂		10mg/M³
		%SiO₂+2
Inert or Nuisance Dust:		
Respirable fraction	15	5mg/M³
Total dust	50	15mg/M³

NOTE: Conversion factors—
mppcf×35.3=million particles per cubic meter
=particles per c.c.

[a] Millions of particles per cubic foot of air, based on impinger samples counted by light-field technics.

[b] The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been specified to be applicable.

[c] As determined by the membrane filter method at 430×phase contrast magnification.

[d] Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an ARC instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 Mg/M³ in the table for coal dust is 4.5 Mg/M³.

2 A new § 1910.93a is added to Part 1910. The new § 1910.93a reads as follows:

§ 1910.93a Asbestos dust.

(a) The 8-hour time-weighted average airborne concentration of asbestos dust to which employees are exposed shall not exceed 5 fibers per milliliter greater than 5 microns in length, as determined by the membrance filter method at 400–450× magnification (4 millimeter objective) phase contrast illumination. Concentrations above 5 fibers per milliliter but, not to exceed 10 fibers per milliliter, may be permitted up to a total of 15 minutes in an hour for up to 5 hours in an 8-hour day.

(b) Engineering methods, such as but ot limited to, enclosure, vacuum sweeping, and local exhaust ventilation, shall be used to meet the exposure limits prescribed in paragraph (a) of this section. Where such engineering methods are not feasible, or do not otherwise reduce the concentrations below those prescribed in paragraph (a) of this section, respiratory protective devices shall be provided and used in accordance with paragraph (c) of this section

(c) (1) (i) When the limits of exposure to asbestos dust prescribed in paragraph (a) of this section are exceeded and when engineering controls required by paragraph (b) of this section are not feasible or do not otherwise reduce the concentration of asbestos dust below those prescribed in paragraph (a) of this section, the employer shall require the use of respiratory protective devices. The selection of respiratory protective devices shall be limited to those specified in the remaining subparagraphs of this paragraph (c).

(ii) The employer shall require that each employee test his respiratory protective device before each use in order to insure a proper fit according to the manufacturer's instructions. The employer shall further provide for effective training or supervision of employees in the testing of respiratory protective devices for fit before their use.

(2) For an atmosphere containing not more than 25 fibers per milliliter greater than 5 microns in length over an 8-hour average, or more than 50 fibers per milliliter over any period of 15 minutes, a reusable or single-use filter type respirator, operating with negative pressure during the inhalation phase of breathing, approved by the U.S. Bureau of Mines under the provisions of 30 CFR Part 14 (Bureau of Mines Schedule 21B), or a valveless respirator providing equivalent protection, shall be used.

(3) For an atmosphere containing not more than 250 fibers per milliliter greater than 5 microns in length over an 8-hour average, or more than 500 fibers per milliliter over any period of 15 minutes, a powered filter positive pressure respirator approved by the U.S. Bureau of Mines under the provisions of 30 CFR Part 14 (Bureau of Mines Schedule 21B) shall be used.

(4) For an atmosphere containing more than 250 fibers per milliliter greater than 5 microns in length over an 8-hour average a type C positive pressure supplied-air respirator approved by the U.S. Bureau of Mines under the provisions of 30 CFR Part 12 (Bureau of Mines Schedule 19B) shall be used.

(5) The employer shall establish a respirator program in accordance with the requirements of American National Standard Practice for Respiratory Protection Z88.2—1969.

(6) The respirators provided each employee shall be properly inspected, cleaned, repaired and stored.

(d) (1) When an employer has employees who are exposed to asbestos dust exceeding the limits prescribed in paragraph (a) of this section and the exposure results from the operations described in the remaining subparagraphs of this paragraph (d), the employer shall comply with the requirements of these subparagraphs relating to the operations involved. The requirements of this paragraph are in addition to those prescribed in paragraph (b) of this section.

(2) All hand- or power-operated tools which produce asbestos dust such as, but not limited to, saws, scorers, abrasive wheels, and drills shall be provided with local exhaust ventilation and dust collectors in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems; ANSI Z9.2—1971.

(3) Employees exposed to the spraying of asbestos or the demolition of pipes, structures, or equipment covered or insulated with asbestos shall be provided with respiratory protective devices in accordance with paragraph (c)(4) of this section.

(e) Asbestos cement, mortar, coatings grout, and plaster shall be mixed in closed bags or other containers.

(f) Asbestos waste and scrap shall be collected and disposed of in sealed bags or other containers.

(g) All cleanup of asbestos dust and blowing shall be performed by vacuum cleaners. No dry sweeping shall be performed.

3. Section 1910.12 is amended by changing paragraph (a) in order to apply the emergency standard prescribed in the new § 1910.93a, which is published in this document, to construction work which is subject to the Act. The amendment is necessary in light of the rule of regulatory construction set forth in § 1910.5(c). As amended, § 1910.12 reads as follows:

§ 1910.12 Construction work.

(a)(1) *Adoption and extension of established safety and health standards for construction.* The standards prescribed by Part 1518 of this title and in effect on April 28, 1971, are adopted as occupational safety or health standards under section 6(a) of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in construction work. Each employer shall protect the employment and places of employment of each of his employees engaged in construction work by complying with the appropriate standards prescribed by this paragraph.

(2) The standards prescribed in § 1518.55(c) of this title shall apply in the case of the exposure of any employee in construction work to airborne asbestos dust.

Effective date. These amendments shall become effective immediately upon publication in the FEDERAL REGISTER (12–7–71).

(Sec. 6(c), 84 Stat. 1596, 29 U.S.C 655; Secretary's Order No. 12–71, 36 F.R. 8754)

Signed at Washington, D.C., this 2d day of December 1971.

G. C. GUENTHER,
Assistant Secretary of Labor.

[FR Doc.71–17883 Filed 12–6–71;8:47 am]

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SUBJECT TO
PROTECTIVE ORDER RE DISCOVERY MATERIALS
MARCH 30, 1983
HON. IRA A. BROWN, JR.
COORDINATION TRIAL JUDGE
SUPERIOR COURT OF THE STATE OF CALIFORNIA
CITY AND COUNTY OF SAN FRANCISCO
JUDICIAL COUNCIL COORDINATION
PROCEEDING NO. 1702

CONFIDENTIAL

FILE

General Headquarters
February 17, 1971

J. B. Jobe
F. H. May
A. B. Merchant

J-M Retiree Study

Attached is copy of the report entitled "Mortality Patterns of a Group of Retired Asbestos Workers".

This study was undertaken in 1968 by Dr. P. E. Enterline, School of Public Health, University of Pittsburgh. The data includes those who retired prior to January 1, 1968, from plant locations in the U. S. and Canada (except Jeffrey Mine and Asbestos Plant) in which asbestos and silica are used in the products manufactured.

Dr. Enterline is currently expanding the study to include Jeffrey Mine and Asbestos Plant. In addition, and in order to have a non-exposed control population for direct comparison, Dr. Enterline is analyzing the data from our other locations--fiber glass, mineral wool, wood fiber, perlite operations, as well as sales offices and General Headquarters. A final comprehensive report will be made when this work is completed.

The study is a "first" in examining the mortality patterns of a group of people who attained the age of 65 after employment in a particular industry.

Certain perspectives should be kept in mind in reading the summary observations (p.123):

1. The fact that mean age at time of first employment with J-M was 39.8 years provides a basis for raising question as to what effect prior employment might have had in the observed mortality patterns.

2. Since the median length of employment was approximately 25 years and the median year of retirement was 1956 for production and 1957 for maintenance, the median potential exposure years would be roughly 1930 to 1939. This would indicate that the beneficial effects of the improved dust control over the last 10 years are not significantly reflected in this data. The degree to which they might modify the mortality patterns can only be determined by future studies.

3. The high risk association observed in the maintenance-service group raises question concerning the import of intermittent but possibly high, short duration exposures. Our industrial hygiene survey procedures in the past have not measured exposures of this type. With the personal sampling technique now used, it will be possible to do so, and the Environmental Control Department will incorporate such in its regular survey procedures.

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4. The estimates of exposure related to individual work records were based on our industrial hygiene survey data for the most recent 10 years. For the periods of time prior to that, estimates of exposure levels were determined by our consultation and discussion with plant management at each location, including review of dust control appropriations, plant equipment, process and product changes. Obviously, there are potentials for some error in this approach.

The study, therefore, does not provide any substantial basis for pinpointing a safe exposure level. High exposure scores (as defined) do, however, relate to the elevated standard mortality ratio for respiratory disease (pneumoconiosis).

Should you have comment or question, I would be glad to review the study with you in more detail.

H. M. Jackson

HMJ/md
ccs:
G. P. Wright, M. D.
T. H. Davison, M. D.

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MORTALITY PATTERNS OF A GROUP OF RETIRED ASBESTOS WORKERS

By

Pierre Decoufle, Sc.D.

Under the direction of

Philip E. Enterline, Ph.D.

(In fulfillment of a contract between the Johns-Manville Corporation and the University of Pittsburgh instituted May 1, 1968)

University of Pittsburgh

December, 1970

Depo Ex No. 21
cm 6/28/84

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APPENDIX A 1[illegible]
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I. INTRODUCTION

A. Background of the Problem

Numerous reports by many investigators from various countries have established the fact that an occupational inhalation of dust of different chemical and physical types of asbestos results in the development of asbestosis of the lungs which may be designated as an occupational pneumoconiosis.

In 1906, Montague Murray reported the case of an asbestos worker who had died in England in 1900 of "typical fibroid phthisis".[1] Sporadic such cases continued to be recorded and, finally, in 1928 Seiler reported on a case which seemed definitely to establish the relationship between the inhalation of asbestos dust and disabling and fatal pulmonary fibrosis.[2] The report by Merewether and Price (1930) remains the authoritative account of the disease whereby its occupational origin was proved and, accordingly, asbestosis was recognised as a compensatible disease under the Workmen's Compensation (Silicosis and Asbestosis) Act of 1930 in England.[3]

This particular disease results in a slowly progressive pulmonary fibrosis of the diffuse, interstitial variety which is irreversible. The length of time usually required to instigate these lesions varies, with individual response also depending on the intensity of exposure during this time.

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Since 1935 an increasing amount of epidemiological, clinical, and pathological evidence also incriminates this health hazard as one of the environmental sources of lung cancer. In 1935 Lynch and Smith reported a case of lung cancer in a man with asbestosis.[4] The association of what were then both relatively rare diseases prompted the suggestion that there might be an etiologic relationship between them.

This possibility was strengthened by additional reports from Great Britain.[5] Between the years 1924 and 1943 a total of 392 deaths of males with asbestosis recorded on the death certificate were reported to the Medical Branch of the Chief Inspector of Factories. Of these deaths, 121 or 30.9 per cent were found to have lung cancer also recorded on the death certificate. By contrast, in 1964, which year represented the highest lung cancer mortality yet published for Great Britain, only 7.9 per cent of all deaths in males 20 years of age or older were due to lung cancer.

Asbestos-induced lung cancer is characterized by a latent period during which there are no clinical signs of the disease. It seems that at least 15 years from onset of exposure are usually required before this disease is manifested.

As asbestos dust levels in asbestos products manufacturing plants decrease over time to levels which are insufficient to cause clinical asbestosis it is still to be investigated whether there might be an excess risk of lung cancer in the absence of asbestosis.

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The possibility of a causal relationship between asbestos exposure and neoplasms of the mesothelial surfaces of the pleural and peritoneal cavities was strongly suggested by a report from South Africa in 1960 by Wagner and his associates.[6] These tumors now follow asbestosis and lung cancer as an important cause of death among asbestos workers. As with lung cancer, there is no regular correlation between the severity of asbestosis and the occurrence of mesotheliomas, and many instances occur in subjects in whom there is little or no evidence of asbestosis. The latest period of these tumors is usually over thirty years from onset of exposure.

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B. Review of Selected Epidemiological Studies of Asbestos Workers

In England, Doll conducted a study of 113 men employed an asbestos textile factory where chrysotile asbestos was used almost exclusively.[7] The follow-up of each man began when he had completed 20 years of employment in areas where he was liable to be exposed to asbestos dust. Under this design, men first became eligible for follow-up in 1922 and all observation was terminated in 1953. Mortality among the subjects was analyzed between the ages 30 and 79.

It was found that a total of 30 deaths occurred in this group whereas only 18.4 were expected on the basis of the male population of England and Wales. The number of deaths from lung cancer was 11 observed versus 0.8 expected - a ratio of 14 to 1. All of these cases

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of lung cancer were associated with the presence of asbestosis. A crude dose-response relationship was then investigated by subdividing the sample into two groups according to length of employment (1 to 10 years, over 10 years) before January 1, 1933 - the date when regulations for the control of asbestos dust in factories became effective. Before this date, dust exposures were relatively higher than in subsequent years. It was found that as the length of employment before January 1, 1933 increased the ratio of the number of observed deaths from lung cancer to the expected number of lung cancer deaths (assuming that the risk was constant for varying lengths of employment before 1933) increased indicating that the incidence of lung cancer increased with increasing length of service before 1933.

Hammond et al. have extended the study by Doll to include those men who were first employed with the same asbestos company after 1933 and who had at least 10 years of exposure in areas where they were liable to be exposed to asbestos dust.[8] The period of observation was also increased to the middle of 1966.

As previously reported, the men who had 20 or more years of employment in dusty areas and who worked for some time before 1933 experienced a significant excess mortality from all causes. There were 71 observed deaths in all whereas only 33.3 were expected. In addition, a significant excess in mortality from lung cancer was found with 17 observed deaths from this cause against only 2.6 expected.

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Again a dose-response relationship was examined, this time subdividing all men with at least 20 years of exposure in dusty areas into three subgroups characterized by their length of employment before 1933 (none, 1 to 10 years, over 10 years). After standardizing for length of observation and age a statistically significant reduction in mortality from lung cancer was found with reduction in length of exposure before 1933. This is in agreement with Doll's original conclusions and confirms that there was a significant decrease in the occupational hazard since 1932.

When the group of men who had 10-19 years of exposure in dust areas but were first employed after 1933 was analysed it was found that there were 6 observed deaths due to lung cancer while 6.4 were expected. However, the authors are reluctant to interpret this apparent deficit as a real lowering of the lung cancer risk for this group of asbestos workers because of some possible artifacts in the data.

Mancuso conducted a follow-up study of 1,366 white male employees of an asbestos products manufacturing plant who were working there in 1938 or 1939.[9] The period of observation lasted until mid-1960. During this time there was a total of 166 deaths between the ages 25 and 64 of which 22 were due to asbestosis. Expected deaths for various causes were based on the average annual death rates for the state of Ohio which were computed from information reported on death certificates during the period 1950-1960 and population statistics from the U.S. decennial censuses.

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Only 136.4 deaths from all causes were expected whereas 166 were observed. Fifteen deaths due to lung cancer were observed while only 5.4 were expected. In addition, an excess for cancer of the digestive organs and peritoneum was noted with 15 observed deaths versus 7 expected. Manuso points out that these findings may be considered conservative for several reasons. One was the observed utilization factor of using a total plant population rather than the more limited population at specific occupational risk. Information on duration of employment was not available for the entire cohort. Furthermore, slightly over two-thirds of the members of the cohort were in the age group 15 to 34 in 1938 and the war and related events affected the pattern of continuity and duration of employment of these cohort members. The author also points out that an additional case of lung cancer was derived from microscopic review.

With respect to the association between asbestosis and lung cancer in this study it was found that of the 15 deaths due to lung cancer, 6 also had asbestosis present.

Selikoff et al. studied a group of 632 male insulation workers who had only intermittent exposure to materials containing limited amounts (often 2% to 20%) of asbestos under working conditions varying from very dusty, as in removing old insulation in closed quarters, to those with little dust exposure as in building construction in open air.[10] This group consisted of all individuals who were members of two locals of a labor union as of January 1, 1964. However, a man entered the

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observation period only after completing at least 40 years of exposure to asbestos dust. This condition is similar to the one which Doll had previously imposed on his subjects and stems from the recognition that neoplasia associated with asbestos exposure seldom occurs in less than 20 years from first exposure to the first (latent period).

For this study all observation ceased on December 31, 1964 (giving a maximum of 21 years of follow-up) and mortality was analyzed for all ages over 35. It was found that over the entire period of observation 255 deaths from all causes occurred whereas only 203.1 were expected based on the white male population of the United States. Of these deaths 45 were due to cancer of the lung while only 6.5 were expected, yielding a near seven-fold increase in the risk of this disease among such insulation workers. The authors give no indication of the presence or absence of asbestosis in any of the 45 observed lung cancer deaths. Of added interest is the disparity between observed and expected deaths from cancers of the stomach, colon, and rectum combined, noted in this study. There were 29 observed deaths due to these causes whereas only 9.4 were expected, a three-fold excess risk.

Enterline studied a cohort of white males who worked in certain asbestos products plants in the United States at some time during the period 1940-51.[11] For use as a control a cohort of white males who worked in certain cotton textile plants in the United States was defined in the same way. Men in these latter

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plants were exposed to a dusty [illegible] environment also, albeit, one which had not been associated with the occurrence of neoplasia. All of the subjects were followed up to June 30, 1963 and mortality between ages 15 and 64 was analyzed. The men in the asbestos cohort were divided into three groups according to the type of asbestos products that were manufactured by the plant in which they worked in 1948-51. The three product lines were asbestos building products, asbestos friction materials, and asbestos textile products. It was stated that dust exposures were probably less in building products plants than in friction materials and both of these considerably less dusty than asbestos textile plants.

Information on the death certificate regarding asbestosis present as either the underlying cause of death or a contributory cause indicated that this disease appeared on death certificates most frequently for workers in asbestos textile products plants which seemed to confirm previous impressions regarding general levels of asbestos-dust exposure in the three asbestos products industries studied.

Standardized Mortality Ratios of observed to expected numbers of deaths were computed for various causes of death where the expected numbers of deaths were based on the age-cause-specific mortality rates in the white male population of the United States. The men employed in the cotton textiles plants experienced no significant

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excess mortality from any cause but did exhibit a remarkable deficit in deaths due to cancer of the respiratory system (SMR=31.1) which was unexplainable.

Of the three groups of asbestos workers only those in asbestos textiles plants showed excess mortality from all causes (SMR=126.6). Slight excesses for cancer of the respiratory system were seen in workers from asbestos building products plants (SMR=130.4) and in workers from asbestos friction materials plants (SMR=123.7). However, excess mortality due to this cause was more substantial in the workers from asbestos textiles plants (SMR=228.6). In the case of asbestos friction materials and asbestos textiles products workers the excess in deaths from diseases of the respiratory system was entirely due to deaths from asbestosis. In the asbestos textile products industry cancer of the digestive system appeared to be high (SMR=146.3).

Jacob and Aespach analyzed the mortality experience among workers in the Dresden asbestos industry from 1952 to 1964.[12] The asbestos exposure for these subjects occurred in occupations in the mining, weaving, and grinding departments of a brake lining factory, in the production and processing of asbestos textiles and asbestos cement products. In these operations all types of asbestos were used. The group studied consisted of 1,321 men and 1,126 women.

It was found that lung cancer and mesothelioma of the pleura were significantly increased among asbestos workers in the Dresden

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area when compared with the general population of that area of corresponding age and sex. Among the men in the study 23 deaths due to lung cancer were observed while only 11.1 were expected. In women there were 13 observed deaths from cancers of the lung and pleura whereas only 6.8 were expected.

Of the 1,521 men 436 were found to have asbestosis and of these 17 died of lung cancer. Only 3.1 would have been expected to die in this subgroup from this cause. Comparison of this ratio (17:3.1) with the corresponding ratio for all the men (23:11.1) seems to indicate that the risk of dying from lung cancer among Dresden asbestos workers is higher for those already suffering with asbestosis. Similar results were seen for the women. Unfortunately, no information on the age distribution of either the asbestosis cases or the rest of the subjects is given. Such data might aid in further interpreting these findings. For example, if the asbestosis cases were, on the average, much older than the non-cases this might imply a longer duration of asbestos exposure and hence make the asbestosis cases a higher risk group, per se.

In England, Newhouse studied 4,995 males who were employed with a particular asbestos products factory for at least 30 days anytime after April 1, 1933.[13] The follow-up of these subjects lasted to 1964 giving a maximum of 31 years of observation. The chief products of this factory were asbestos textiles and all types of insulation materials. Crocidolite, amosite, and chrysotile asbestos

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were all used in the manufacturing of the various products. Each man was categorized by the length of time spent actually working in the factory (under 2 years and over 2 years) and by the exposure grading of the dustiest job he had held (low, moderate and severe). Expected deaths for all causes were obtained from the mortality experience of England and Wales. The Case-Pearson tables of age-specific death rates for cancers of various sites and for respiratory diseases were used to obtain expected deaths for these specific causes.

The results of the study showed that an excess of observed over expected deaths did not occur until at least 16 years had elapsed after first exposure and then only in workers who had held jobs with the highest dust exposure rating. After this interval of time there was a statistically significant excess in deaths from cancer of the lung and pleura and from other cancers, both in men with less than 2 years of exposure and in men with more than 2 years of exposure. This seems to imply that men with brief but intense asbestos dust exposure, if followed for a long enough time period (at least 16 to 20 years) will exhibit excess mortality from lung cancer. For the category of respiratory diseases which includes asbestosis there was a significant excess in mortality only for the group of men who were exposed longer than 2 years and had worked in a job with a "severe" exposure rating. This finding would seem to emphasize

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[illegible] STUDY

A. Objectives

There are several objectives in the present study. The most general one is to determine whether men who retire from one particular asbestos products manufacturing company after having worked in its asbestos products plants experience different patterns of mortality than the U.S. white male population of the same age at the same point in time. Because of previous findings in asbestos workers, some of which have been summarized above, particular attention will be paid to mortality from lung cancer, cancer of the digestive organs and peritoneum, and diseases of the respiratory system (which include asbestosis) observed in these retirees.

Other more specific objectives involve examining the effects of various characteristics of the pre-retirement work experience of these men on their subsequent mortality. Such variables include the usual occupation of the man during his employment in the asbestos products plants, the type of asbestos products with which he was primarily involved, and the amount of asbestos dust exposure he acquired before retirement.

The analysis of mortality by usual occupation will essentially contrast those retirees who worked primarily in production jobs with those retirees who worked primarily in maintenance and service

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the importance of a long, continuing exposure period with episodes of intense dust concentration for the production of asbestosis.

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positions. To date, no other study has separated these two types of exposures (steady versus intermittent) for the purpose of a comparative mortality analysis.

The possibility of dividing the retirees into various subgroups according to the type of asbestos products with which they were primarily involved would enable any differential mortality which may be associated with this variable to show up. Only Enterline was able to separate a cohort of asbestos workers into subgroups which reflected to some degree the kind of asbestos products with which his subjects were working. The other studies quoted above either were not able to subdivide their cohort (Nicholson, Newhouse, Jacob and Anspach) or were dealing with homogeneous workers (Doll, Knox et al. - asbestos, textiles and Selikoff et al. - asbestos insulation products).

A quantitative measure reflecting the amount of asbestos dust exposure acquired by each man will be developed and used as an independent variable in the analysis of mortality from the specific causes listed above. This will lead to an attempt to define a dose-response relationship between amount of asbestos dust exposure and mortality from lung cancer. Crude estimates of dose were used by Doll and Knox et al. (years of employment before 1933), Enterline (the various asbestos products industries), and Newhouse (exposure rating of the dustiest job held during the follow-up period) to establish some kind of dose-response relationship between amount of exposure

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and lung cancer mortality. It is hoped that a more precise estimate of dose can be defined for the subjects in the present study.

Within the analysis of amount of asbestos dust exposure and mortality from lung cancer the effect of the age of the retiree at first employment with the asbestos products company will be investigated. Specifically, mortality from lung cancer will be studied within a low-dose group of retirees for both men who began work with the asbestos company at a relatively young age and for men who began work at a relatively old age to see if any differential in lung cancer mortality exists. Similarly, within a "high-dose group of retirees the same calculations will be carried out. These detailed analyses will essentially contrast high doses spread out over a long period of time with high doses acquired in a short period of time. A similar contrast for low doses of asbestos dust exposure is implied. Here it should be kept in mind that short periods of employment and occupational exposure only occur during the older working ages of men and never during their younger working ages.

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B. Limitations

An analysis of the mortality among retirees such as is presented here should be put into perspective, i.e. it must be realized that this group is only one part of the population of all men who were ever employed in the asbestos products plants of this particular company.

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As a matter of fact, it is a very biased sample from this population since it consists only of men who remained employed and lived long enough to retire from the company. Furthermore, it excludes that group of men who were employed with the asbestos company at some time in their life but for one reason or another did not remain employed long enough to retire from the company although they did reach retirement age elsewhere (whether employed at that time or not).

Although it is true that retirees are a survivor group in a well-defined sense, it is not completely realistic to therefore assume that they can provide no information on asbestos-induced disease, especially lung cancer. Since 1965 lung cancer death rates in the U.S. have reached a peak after 65 years of age. This together with the long latent period associated with "asbestos-lung cancer" seems to indicate that a study such as the present one might prove to be indeed fruitful, although not necessarily yielding a true measure of risk.

If the population at risk for this investigation is taken as all men who have worked in asbestos products plants in the United States and eventually retired from the company to which the plants belong the present group of subjects is not a random sample from this population simply because it consists of the retirees from only one asbestos products manufacturing company. The asbestos products plants in this particular company may possess certain characteristics which are in marked contrast to the plants of other companies. For instance, they may be situated in different geographical areas of the

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country, consist disparate embodiments of ventilation and dust suppression equipment, and even be constructed in quite diverse ways. Manufacturing processes and the types of asbestos used in the plants under study may also differ remarkably from other asbestos products manufacturing plants in the United States.

On the other hand, results from the present study warrant the attention of the entire asbestos industry as indications of what might be expected on a broader scale among all of its retirees.

Unfortunately, in this study a large enough group of retirees from the same asbestos company who acquired no asbestos dust exposure during their working lifetime was not available to serve as a control group for comparison purposes. Such a cohort would be very desirable as a control because each member would have been actually at work right up to retirement age as was the asbestos-exposed group.

Instead, recourse was made to the United States white male population of the same age at the same point in time to serve as a control group. There is a basic drawback to using national data such as this for comparison with the retirees under study. The fact that the men in this investigation reached retirement age while actively at work with the asbestos company implies that they were relatively healthy at the time they left the company. However, all white males in the United States reaching a comparable age include many who have been chronically ill up to that time and are subject to a high probability of

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dying shortly after reaching this age. Consequently, during the first few years after retirement, at least, it might be expected that the retirees should experience a more favorable mortality pattern than the population of white males simply because they were healthier to begin with.

An additional objection to comparing mortality of men who worked in asbestos products plants with general population mortality is that general population rates are not available for a number of characteristics which are known to contribute to differential mortality. Macmahon has noted, for example, that cancer incidence for a number of sites is quite different for native and foreign-born groups.[14] Another variable known to affect overall mortality as well as mortality from certain specific causes is socio-economic level. The group of retired asbestos workers being studied here is made up primarily of "blue collar" workers while in the U.S. white male population this occupational class constitutes less than half of all employed persons.

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III. DATA

A. General Description of Data

In 1941 the asbestos products manufacturing company instituted a retirement plan which provided for compulsory cessation of employment with the company thereafter for every employee reaching age 65. This is termed a "normal" retirement. The retirement plan included a provision that those who were 65 or older in 1941 could work for an additional 24 months before accepting their retirement. Because of this and the necessity of retaining some older men during World War II there were men retiring during the period 1941 to 1945 who were older than 65 years of age.

The retirement plan also provided for two types of retirement at ages under 65. One was the 'disability' retirement which allowed a worker with sufficient employment service to leave the company when he had developed an injury or disease severe enough to prevent him from continuing in his job. Such a person was entitled to financial benefits from the company to help compensate for his disability.

The other type of retirement at ages under 65 was termed an "early retirement. Under this plan a worker could elect to leave the company for any personal reason and receive financial benefits in proportion to what he had already contributed himself to the retirement plan. It was also necessary in this case to have had a sufficient number of years of employment with the company before being able to exercise this privilege.

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During the course of time since these provisions were first implemented many workers who technically qualified for a "disability retirement were allowed to leave the company with an "early" retirement if it meant added financial benefits for them. Hence, the term "early retirees" can also refer to those separating from the company at ages under 65 with physical and mental disabilities.

It was decided to limit the study to those individuals retiring between July 1, 1941 and December 31, 1966 who had worked in any of eleven of the company's asbestos products plants immediately prior to retirement. This definition excludes some persons who had had work experience in these plants but who subsequently moved into sales, clerical, or administration positions with the company at other locations.

Altogether 1,735 such retirees were identified by the asbestos products company. Table 1 gives the distribution of these individuals by sex and type of retirement.

The relatively small number of female retirees made it impractical to study them as a separate cohort. In addition, including them with the male retirees would introduce a degree of heterogeneity which was considered unreasonable. For these reasons the female retirees have been excluded from the present study.

The 1,149 males listed as normal retirees comprise the main part of the group chosen for the present study. Included in this category are 107 men who were actually older than 65 at retirement. The latter individuals were almost always those men who were already 65 at the

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Table 1

Distribution of 1,735 Persons Retiring from an Asbestos Products Company between July 1, 1941 and December 31, 1966 by Sex and Type of Retirement after Having Worked in any of 11 of the Company's Asbestos Products Plants Immediately Prior to Retirement

Type of Retirement	Both Sexes	Male	Female
All Types	1,735	1,624	111
Normal	1,205	1,149	56
Early	182	157	25
Survived to Age 65 (as of 12-31-66)	104	88	16
Disability	348	318	30
Survived to Age 65 (as of 12-31-66)	72	63	9

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time of the initiation of the retirement plan and left the company under the provision described above.

It was decided to augment the main study group of 1,149 subjects with these early and disability retirees who reached age 65 by December 31, 1966. There were two major reasons for this decision. One was the enlargement, somewhat, of the viewpoint of the study to the examination of mortality patterns at age 65 and over for men who had worked in the asbestos products plants of this company regardless of whether or not they had been continuously employed there until age 65. The 191 early and disability retirees included in the study are a small fraction of the men who permanently left employment in the asbestos products plants of the company before reaching age 65 and who survived to this age.

The second reason for inclusion of this group was to make the entire study cohort more comparable to the U.S. white male population which is to serve as a control group. In general, it is to be expected that men retiring at age 65 are healthier, as a group, than the national population of men of the same age since the latter group contains many individuals who have been chronically ill up to that time. However, many of the early and all of the disability retirees who survive to age 65 are chronically ill at that point and so dilute the general healthiness of the normal retirees resulting in a cohort which is more comparable to the male population of the same age.

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Exactly 1,300 male retirees comprise the final study group. Their mortality was examined through December 31, 1967 - the closing date of the study. This enabled each retiree to be followed for at least one year.

Of the eleven plants in which the retirees worked the largest are in the Northeastern and North Central sections of the U.S. with other smaller plants located in the South and Far West. One small plant is in the Province of Ontario, Canada from which 11 men qualified to enter the study. Most of these plants were engaged in the production of several types of asbestos products at the same time.

The output of these plants included: asbestos textiles, asbestos packings and friction materials, asbestos insulation products, and asbestos building products. This latter category includes: asbestos paper, asbestos shingles, asbestos floor tile, asbestos paints and putties, asbestos wall board, and transite pipe. One small plant and certain departments of some of the larger plants manufactured asphalt roofing materials, some of which contained no asbestos. The subjects of this study, then, represent the full spectrum of asbestos dust exposures and are, indeed, a heterogeneous sample with respect to this characteristic.

Information on each retiree needed to carry out the present study was provided by the asbestos products manufacturing company. Transcription of basic data from company employment and medical records onto a survey form (see Figure 1, Appendix A) especially

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designed for the purpose was done by staff employees of the company at the various plants. The major items among the data on each retiree included birth date and birthplace, race, type of retirement, presence or absence of pneumoconiosis at first employment with the company and at retirement, vital status as of January 1, 1968, and a complete work history from time of first employment with the company until retirement.

For those retirees who died on or before December 31, 1967 a copy of the death certificate was requested from the health department of the state in which the death took place. From these death certificates the underlying cause of death was determined and coded according to the Seventh Revision of the International Classification of Diseases[19] by a nosologist trained at the National Vital Statistics Division of the U.S. Public Health Service. In addition, other selected conditions entered on the death certificates were coded. For example, if lung cancer and asbestosis were both listed on the death certificate and the underlying cause of death was coded as lung cancer, it was routine to code the asbestosis separately as a contributory cause of death.

For each job that a man held during his entire employment with the asbestos products manufacturing company, the following items were coded: beginning and ending dates, department in which the job was performed, the exact title of the job, an estimate of the overall airborne dust concentration in the immediate vicinity of

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the job, and the type of asbestos contained in the products that were manufactured by that department.

In arriving at the estimated exposure rating for each job, the company used its current Environmental Hygiene Survey results as the basis for considering past exposures. These survey reports were initiated around 1955, and for the period of time preceding, earlier conditions were discussed with long service employees. Changes in conditions were related to process changes, machine in... stions, ventilation control expenditures, and a judgment determination was made. From these judgments a Potential Exposure Schedule was developed for the job classifications within each department. These schedules were drawn up separately for each of the asbestos product plants covered in this study.

The format of such an exposure schedule is essentially a cross-classification between the various jobs within the asbestos products plants and calendar year with respect to an estimated dust exposure rating. It was decided to use five broad categories to describe the average dust concentration in the immediate vicinity of any one job. The definitions of these five classes in terms of the average dust particle count in millions of particles per cubic foot (mppcf) are:

LEVEL I :	Less than 5 mppcf
LEVEL II :	5-10 mppcf
LEVEL III :	10-30 mppcf
LEVEL IV :	30-50 mppcf
LEVEL V :	over 50 mppcf

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The upper limit used to define LEVEL I is the same as the Threshold Limit Value (TLV) for asbestos dust established by the American Conference of Governmental Industrial Hygienists following a 1937 study of asbestos textile workers in a single plant by the United States Public Health Service.[16] This TLV has been based on results taken from an environment which was virtually 100 per cent asbestos dust. Strictly speaking, this is not directly applicable to environments which may be composed of much less than 100 per cent asbestos dust as was the surroundings in which most of the retirees under study worked.

A hypothetical example of a Potential Exposure Schedule is illustrated in Figure 1 for one department of one asbestos products manufacturing plant.

Although containing fictitious data, Figure 1 illustrates some typical patterns such as a general trend in most jobs for the intensity of dust exposure to decrease over time. Sometimes a decrease might be rather gradual as in JOB A while other jobs may exhibit a sharp decrease as in JOB D. Also it happens that some jobs may not yet have reached the lowest level of exposure as in JOBS B and C.

Another characteristic of the working environment of the subjects under study was the distinction between "steady" and "intermittent" dust exposures. All retirees who were primarily engaged in jobs which were directly related to the production of the various asbestos products were considered to have had a "steady" dust

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Job	TIME PERIOD			
	Prior to 1940	1940-1950	1951-1960	After 1960
A	LEVEL III	LEVEL II	LEVEL I	LEVEL I
B	LEVEL II	LEVEL II	LEVEL II	LEVEL II
C	LEVEL I	LEVEL II	LEVEL II	LEVEL II LEVEL II
D	LEVEL V	LEVEL IV	LEVEL II	LEVEL I

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Figure 1. Exposure Levels to Airborne Dust Containing Various Amounts of Asbestos by Job and Time Period in One Department of One Asbestos Products Plant (Fictitious)

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exposure. On the other hand, retirees who worked chiefly in jobs which were not directly related to the daily production operation were assigned to an "intermittent" category of asbestos dust exposure. This latter group of men consists chiefly of maintenance workers such as electricians, millwrights, machinists, etc. and service personnel such as shipping and receiving laborers, truck drivers, etc. Retirees who had worked primarily in office and supervisory positions at the various plants were all considered to have "intermittent exposures to asbestos dust of a Level I intensity.

There were three types of asbestos used in the manufacturing processes at the eleven plants in this study. By far, the most extensively used was chrysotile which was, in fact, an ingredient of every asbestos product made by this company except for certain industrial insulation products manufactured prior to 1964. It constituted between 5 per cent and virtually 100 per cent of the finished products.

Amosite asbestos was used mainly in the industrial insulations division of the company where it constituted from 5 to 40 per cent of the finished products.

Finally, crocidolite or blue asbestos was used primarily in transite pipe products where it constituted 3 per cent of the finished items. There was also small amounts of crocidolite asbestos used in the packings departments of two plants.

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Most industrial insulation products contained both amosite and chrysotile asbestos in combination with cristobalite silica. Together these two types of asbestos constituted between 10 and 15 per cent of most insulation products.

Transite pipe products contained both crocidolite asbestos and chrysotile asbestos in combination with quartz silica. The total asbestos content of this product line was 15 per cent. Most of the other asbestos building products contained between 15 and 40 per cent chrysotile asbestos together with quartz silica.

Asbestos friction materials contained mainly chrysotile asbestos mixed with rubber and assorted resins. The asbestos content of these products ranged from 36 to 55 per cent.

Some of the asbestos plants in the study manufactured packings, textile, paper, and pipe covering products which contained at least 90 per cent chrysotile asbestos.

B. Preliminary Examination of Data

Before becoming involved in detailed analyses of the mortality patterns of the retirees, it is informative to examine the composition of this group with respect to certain pertinent variables.

Table 2 gives the distribution of the retirees by type and year of retirement. Normal retirements among asbestos workers reached a high of 271 during the period 1953-57. The rather low number of normal retirees in the most recent time interval is partly due to the

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Table 2

Distribution of Study Population by Type of Retirement and Year of Retirement

Year of Retirement	Type of Retirement							
	All Types		Normal		>65		Disability & Early	
	No.	%	No.	%	No.	%	No.	%
1941-66	1,300	100.0	1,042	100.0	107	100.0	151	100.0
1941-47	225	17.3	123	11.8	96	89.7	6	4.0
1948-52	208	16.0	195	18.7	4	3.7	9	6.0
1953-57	298	22.9	271	26.0	4	3.7	23	15.2
1958-62	332	25.6	290	24.0	2	1.9	80	52.9
1963-66	237	18.2	203	19.5	1	0.9	33	21.9
Mean Age at Retirement	65.0		65.0		69.0		61.8	

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fact that the cut-off date for entering retirees in the study was December 31, 1966 so that this particular period is about a year shorter than the preceding ones.

These men who were at least 66 years of age at retirement have been separated from the other normal retirees and designated by the symbol 65 . The preponderance of these retirees in the earliest time period is due mostly to the initiation of the retirement plan in 1941. As mentioned above men who were already 65 years of age or older in 1941 were allowed to continue working for up to two additional years from that time.

Most of the early and disability retirees who survived to age 65 retired during the 1955-62 period. One reason for the seemingly low number of these individuals in the last time period is that although there may have been many more early and disability retirees during that period, only a small proportion had reached their 65th birthday before the closing of the study on December 31, 1967.

On the average, the early and disability retirees included in this study were about 3 years younger than the normal retirees at separation from the company whereas the men retiring at ages older than 65 were about 4 years older than the normal retirees. However, for the entire study group the average age at retirement was 65 years.

Table 3 gives the distributic of the retirees by type of retirement and vital status at the close of observation. Overall, slightly more than half of the subjects had died on or before December 31, 1967.

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Table 3

Distribution of Study Population by Type of Retirement and Vital Status on January 1, 1968

Status on 1-1-68	Type of Retirement							
	All Types		Normal		">65"		Disability & Early	
	No.	%	No.	%	No.	%	No.	%
Total	1,300	100.0	1,042	100.0	107	100.0	151	100.0
Alive	636	48.9	535	51.3	9	8.4	92	60.9
Dead	664	51.1	507	48.7	98	91.6	59	39.1

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However, the proportion of deceased varied by type of retirement. A little less than half of all normal retirees had died during the follow-up period. Understandably, most of the retirees who were older than 65 at the time they left the company expired before the closing date since almost all of them entered at the very beginning of the observation period (Table 2). The lowest proportion of retirees who were deceased as of January 1, 1968 occurred among the early and disability retirees who survived to age 65. Approximately 40 per cent of these individuals had expired.

There were 1,291 retirees with complete work histories. These are shown in Table 4 by age at first employment with the asbestos company and year of first employment with the asbestos company.

The distribution of the 1,291 retirees by age at first employment is symmetric about the age group 35-44 years with mean age at first employment about 40 years. It can be seen that as time went on the distribution of the retirees by age at first employment shifted from the younger ages to increasingly older ages. In fact, from the time period prior to 1920 to the most recent time period (1960-69) the average age at first employment increased by approximately 20 years.

This phenomenon is easily explained if one keeps in mind that all of these individuals eventually did retire from the company after first being employed there. Anyone entering employment prior to 1920 and qualifying for retirement sometime after 1960 would in most cases have had to be employed [illegible] Men first employed

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Table 4

Distribution of Claimants with Employment Work Histories
By Age at First Employment and Year of First Employment
With the Asbestos Company

Age at First Employment	All Years		Prior to 1920		1920-29		1930-39		1940-59	
	No.	%	No.	%	No.	%	No.	%	No.	%
15-64	1,781*	100.0	192	100.0	465	100.0	318	100.0	806	100.0
15-24	75	7.4	66	34.4	29	6.2	0	0.0	0	0.0
25-34	335	26.2	85	44.3	207	44.5	43	13.4	0	0.0
35-44	417	32.6	34	17.7	148	31.8	175	55.1	60	19.6
45-54	345	40.9	7	3.6	70	15.1	85	26.7	183	59.8
55-64	89	6.9	0	0.0	11	2.4	15	4.7	53	40.6
Mean Age at First Employment	39.8		29.1		36.2		42.2		49.7	

*Excludes 19 retirees for whom no work history was available.

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during that period in an older age group would have reached retirement age prior to 1940 when there was no retirement plan in effect. Similarly, those men first hired in the most recent time period (1940-59) would not become eligible for retirement during the study period if they were relatively young at the time since they would not reach retirement age until after 1967.

A rough estimate of the average number of years worked with the company by the retirees in this study can be derived by consideration of the two overall mean values given in Tables 2 and 4. From Table 2 the mean age at retirement is 65 years while from Table 4 the mean age at first employment with the asbestos company is about 40 years. Subtracting these two figures would roughly estimate the average length of service as 25 years.

Table 5 gives the distribution of retirees with complete work histories by usual occupation with the asbestos company prior to retirement and age at first employment with the asbestos company. A little over two-thirds of the retirees were categorized as primarily having worked in jobs which were directly related to the daily production operations. About one-fourth of the retirees had been chiefly engaged in maintenance and service positions. The remaining individuals were mostly office and supervisory personnel with a few miscellaneous jobs also included in this sub-division.

Retirees who were primarily involved in production jobs were, on the average, older than either of the other two groups of retirees

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Table 5

Distribution of Retirees with Complete Work Histories By Age at First Employment with the Asbestos Company And Usual Occupation Prior to Retirement

Age at First Employment	Usual Occupation							
	All Jobs		Production		Maintenance & Service		Office & Other	
	No.	%	No.	%	No.	%	No.	%
15-64	1,281*	100.0	800	100.0	343	100.0	138	100.0
15-24	95	7.4	52	6.5	23	6.7	20	14.5
25-34	335	26.2	191	23.9	103	30.0	41	29.7
35-44	417	32.6	272	34.0	112	32.7	33	23.9
45-54	345	26.9	224	28.0	86	25.1	35	25.4
55-64	89	6.9	61	7.6	19	5.5	9	6.5
Mean Age at First Employment	39.8		40.5		39.2		37.8	

*Excludes 19 retirees for whom no work history was available.

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at first employment with the asbestos company. These men who had worked in office and supervisory positions were, on the average, the youngest group with respect to age at first employment - being 3 years younger than those from production jobs. These differences appear to be slight especially between retirees from production jobs and those from maintenance and service positions.

The rather large number of men from maintenance and service jobs enabled this group to be studied apart from other asbestos plant workers.

In Table 4 it was seen that the average age at first employment for the retiree population was approximately 40 years. If it is assumed that these subjects were eligible to begin their working lifetime between ages 15 and 20 then many of the men under study had been employed in diverse occupations for 20 to 25 years before they began work with the present asbestos company. Potentially hazardous exposures may have occurred in some of these previous jobs which could have an effect on the mortality patterns observed in this study.

In an attempt to identify some of these prior health hazards the asbestos company was asked to provide information on any kind of dust exposure retirees might have had before being employed there. Although definite answers to this question were not always available it was found that 128 retirees had worked in coal mines, 24 had worked in jobs involving possible silica dust exposure, and 7 had previous

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asbestos dust exposure. With a little less than half of the subjects having definite answers to this item the above figures underestimate the actual numbers.

In addition, the presence or absence of any type of pneumoconiosis at first employment with the asbestos company as well as at retirement was noted for each man. Unfortunately, complete information on these items was not available for all retirees. Table 6 gives the distribution of the retirees by pneumoconiosis status at first employment and pneumoconiosis status at retirement. Because of the disease process involved here a man having pneumoconiosis at first employment was assumed to have it at retirement when the latter information was unknown to the asbestos company.

The number of men having pneumoconiosis at either point in time is underestimated not only due to the large number of subjects for whom no information was available but also because only rather severe cases of it were transcribed from the medical records of the company. However, this table gives a rough idea of the health of the retirees with respect to a relevant occupational disease which is not necessarily fatal.

Table 7 gives the distribution of the retirees under study by place of birth and vital status at the close of the study. Information on birthplace was more frequently known for the deceased retirees since the death certificate almost always contained this piece of data. Overall between 45.2 and 51.4 per cent of the subjects were foreign-born

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Table 6

Distribution of Study Population by Pneumoconiosis Status At First Employment with the Asbestos Company And Pneumoconiosis Status at Retirement

Pneumoconiosis Status at Retirement	Pneumoconiosis Status at First Employment							
	Total		Present		Absent		Unknown	
	No.	%	No.	%	No.	%	No.	%
Total	1300	100.0	87	6.7	671	51.6	542	41.7
Present	230	100.0	87	37.8	12	5.2	131	57.0
Absent	657	100.0	0	0.0	651	99.1	6	0.9
Unknown	413	100.0	0	0.0	8	1.9	405	98.1

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Table 7

Distribution of Study Population by Place of Birth And Vital Status as of 1-1-68

Status on 1-1-68	Place of Birth							
	Total		United States		Other		Unknown	
	No.	%	No.	%	No.	%	No.	%
Total	1300	100.0	632	48.6	587	45.2	81	6.2
Alive	636	100.0	327	51.4	230	36.2	79	12.4
Dead	664	100.0	305	45.9	357	53.8	2	0.3

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depending on whether the 81 dubious cases are all assigned to one category or another. If these are omitted altogether, then 48.2 per cent of the 632 + 587 retirees were foreign-born.

The 587 retirees known to have been foreign-born came from three main geographic areas: Canada (66), Western Europe (228), and Eastern Europe (280).

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IV. METHOD OF ANALYSIS

To make efficient use of all of the data contained in each retiree's work history it was decided to divide the fifty-year age span (ages 15-64) during which each individual in the study could have worked into five ten-year intervals: 15-24, 25-34, 35-44, 45-54, 55-64. For each of these ten-year intervals two exposure scores were calculated: an unadjusted score and an adjusted score.

In arriving at these scores it was first necessary to assign a numerical value to each of the five asbestos dust exposure categories. An arbitrary weight of 1 was given to all Level I asbestos dust exposures (<5 mppcf). The weights for Levels II-IV were then derived by comparing the midpoint of the dust count range defining each category with the midpoint of Level I which is 2.5 mppcf. The midpoint of Level II (5-10 mppcf) is 7.5 mppcf which is three times the midpoint of Level I. Hence, a weight of 3 was assigned to asbestos dust exposures in the Level II range. The midpoint of Level III (10-30 mppcf) is 20 mppcf which is eight times the midpoint of Level I. This would mean that Level III asbestos dust exposures receive a weight of 8. The midpoint of Level IV (30-50 mppcf) is 40 mppcf which is sixteen times the midpoint of Level I. The weight for asbestos dust exposures in Level IV is 16. The open-ended interval of dust counts defining Level V (>50 mppcf) was arbitrarily assigned a weight of 25. Probably no important bias is introduced with this last numerical weighting

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since only a very small proportion of the jobs held by the retirees under study qualified for an exposure rating of 50 mppcf or greater.

Underlying this whole scheme of assigning numerical weights to the various asbestos dust exposure categories is the assumption that, on the average, the dust count level for all jobs in a given exposure category is close to the midpoint of that category. For example, in giving a weight of 8 to an exposure between 10 and 30 mppcf because the midpoint 20 mppcf is eight times 2.5 mppcf (the midpoint of Level I) it is assumed that dust counts for all jobs in this range average around 20 mppcf.

In a given ten-year age interval a retiree could have worked in one or more departments of a plant (e.g. rigid shingles, friction materials, transite pipe, etc.). For each of these departments an unadjusted exposure score was calculated by determining the length of time (rounded to the nearest year) during which he worked at each of the five levels of asbestos dust exposure. Let these times be denoted by t_1, t_2, t_3, t_4, t_5 and let t_0 be the time spent in a non exposed job. If the numerical weights 1, 3, 8, 16, 25 for the five exposure levels be designated by w_1, w_2, w_3, w_4, w_5 and $w_0=0$ be the weight for a non exposed job the unadjusted exposure score for the i^{th} department is calculated as:

$$s_i = \sum_{j=0}^{5} w_j t_{ij}$$

/ comprehensive unadjusted exposure score for a given ten-year age

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which do not. SMR's provide a perfectly valid scheme for doing this. However, in an analysis of several retiree subgroups it may happen that two or more show excesses in mortality from a specific cause. In this case it would be desirable to rank the excess subgroups without drawing any wrong conclusions. This is possible if the subgroups involved do not differ greatly with respect to variables (e.g. age) other than the one under study.

Virtually all the retirees enter the follow-up period at age 65 so the initial age structures of any two retiree categories are similar. However, since entrance to the observation period continues up to one year before the close of the study, the average length of follow-up available to various retiree categories may differ according to the retirement year distributions of their members. For example, if all members of retiree category A retired between 1945 and 1956 while all members of retiree category B retired between 1960 and 1965, the men in A would have at least 10 more years of follow-up available to them than the men in B. This would mean that the A retirees could age from 65 to at least 80 during the follow-up period whereas the B retirees could only age from 65 to 70. During these added 10 years of observation the retirees in category A are exposed to the risk of dying from diseases whose incidence increases with age such as the class of cardio-vascular-renal diseases as well as diseases with long latent periods, e.g. lung cancer.

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retirees who had worked primarily in production jobs since a knowledge of the specific department in which the man worked day to day was needed. Such a score was intended to quantify an individual's pure asbestos dust exposure as opposed to his asbestos-containing-dust exposure. This kind of an analysis would, hopefully, distinguish between two equal dust doses as defined by the unadjusted score but which were related to quite different percentages of pure asbestos.

The adjusted exposure score is a modification of the unadjusted score. Here, information on the percentage of asbestos in the final product manufactured in each department of each plant is taken into account. The calculation of an adjusted score assumes that the percentage of asbestos in the final product is directly related to the percentage of asbestos in the total airborne dust within a department. In other words, if the product manufactured in a particular department contains 90 per cent asbestos the airborne dust in all parts of this department is assumed to contain a relatively high percentage of pure asbestos dust. Similarly, if the product manufactured in another department contains only 10 per cent asbestos the total airborne dust in all parts of this department is assumed to contain a relatively low percentage of pure asbestos dust.

Although the actual percentage of pure asbestos in the total airborne dust in a department most likely varies with the different operations in that department, it is assumed here that all jobs within the same department expose to the same percentage of pure asbestos

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dust, viz. that of the product manufactured. No attempt was made in this study to distinguish among the various phases of the production operation within each department, e.g. raw material preparation, actual manufacturing, and finishing end. In all likelihood, the concentration of pure asbestos dust was greatest in the vicinity of the raw materials preparation section and least in the finishing end section of a department. Nevertheless, it was felt that the computation of such an adjusted score would be a step in the right direction.

If in a given ten-year age interval an individual remained in one department, his adjusted score (S_A) is gotten by multiplying his unadjusted score for that interval by the percentage (p) of asbestos in the product manufactured there, i.e.

$$S_A = pS$$

However, if in a particular ten-year age interval a person worked in two or more different departments, that part of the unadjusted score (S_i) calculated for each of those departments is first multiplied by the appropriate percentage (p_i); these adjusted sub-scores are then added together to yield the adjusted exposure score (S_A) for that age period, i.e.

$$S_A = \sum_{i=1}^{n} p_i S_i$$

where n is the number of different departments in which the individual worked during that ten-year age interval.

The adjusted scores for each ten-year age period are summed to obtain the total adjusted exposure score for each retiree.

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Two equal adjusted exposure scores may arise from completely different circumstances. For example, suppose one retiree A worked for 20 years in one department in a Level I exposure if the products manufactured in that department contained 50 per asbestos his adjusted exposure score is calculated as:

$$I_A = .10 (20 \times 1) = 10.$$

On the other hand if another retiree B worked for 10 years in a department in a Level II exposure job where the products contain 20 per cent asbestos his adjusted exposure score is calculated as

$$I_B = .20 (10 \times 1) = 10.$$

Because of this numerical equality, the implicit assumption is that these two work experiences are equivalent.

As a further illustration of the effect of these two exposure scores as estimates of dose the following example is given: Suppose that two individuals (C and D) have worked in an asbestos products plant for 10 years and 5 years respectively. C has worked continually at a Level I dust exposure where the products contain 20 per cent asbestos. D has worked continually in a Level III dust exposure where the products contain 75 per cent asbestos. Figure 2 summarizes these estimates of dose for these two individuals.

If length of exposure is used as the measure of dose then C's exposure has been twice as great as D's exposure. However, if the overall intensity is also taken into consideration the dose becomes the same for both individuals. Finally, if the percentage of asbestos is

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Dose / Person	Length of Exposure	Unadjusted Exposure Score	Adjusted Exposure Score
A	16 years	16 x 1 = 16	.25 x 16 = 4
B	2 years	2 x 8 = 16	.75 x 16 = 12
Ratio of Doses (A/B)	8 : 1	1 : 1	1 : 3

Figure 2. Three Estimates of the Amount of Asbestos Dust Exposure Accumulated by Two Individuals in an Asbestos Products Plant

used in the estimate of dose the situation is changed once more with B's asbestos exposure now 3 times as great as that for A.

In a study which used only length of exposure as an estimate of dose, worker A would most likely be assigned to a higher dose category than worker B. Under the definition of dose in terms of length and intensity of exposure worker A and worker B would probably both be assigned to the same category of dose. Introducing the percentage of asbestos relevant to the two working environments leads to still a different assignment of dose. Now worker A would likely be put into a lower dose category than worker B.

Working environments which are homogeneous with respect to the percentage of asbestos in the manufactured products such as asbestos textile plants do not require the use of adjusted exposure scores to estimate dose. If it could also be established that all workers were subject to the same intensity of exposure there is no need of even an unadjusted score. Length of employment in the plant would probably suffice as an estimate of dose. However, with the multiplicity of asbestos products and exposure intensities to which the retirees in the present study were subjected the need for more complex estimates of dose are required. These may still be imperfect in developing dose response relationships but are better than length of employment.

The initial use of the unadjusted exposure scores was in facilitating the subdividing of all retirees who worked primarily in production jobs by the type of asbestos products with which they were chiefly

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JMB 27873

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involved prior to retirement. The categories of asbestos products chosen for this study together with their distinguishing characteristics are given in Table 8.

Whenever a retiree had worked in two or more departments characterized by different types of asbestos products, the unadjusted exposure score acquired in each of these environments was computed and the man was assigned to that category in which he had compiled the highest unadjusted score. In the case of ties, the length of time spent in each division was used as the deciding factor.

Some retirees had worked primarily in departments which produced asphalt roofing materials. In these sections there was virtually no asbestos dust exposure and consequently these individuals have been omitted from the more detailed analyses. A few of the men in this group had had brief episodes of asbestos exposure in other departments but the time was very short in comparison with that spent in the roofing sections. The chief exposures in asphalt roofing departments are dusts of talc, mica, and silica in varying amounts as well as asphalt fumes. No exposure scores were calculated for this group of retirees.

In evaluating the mortality patterns of the retirees, the principal measure used is the Standardized Mortality Ratio (SMR).

The SMR is the ratio of observed (O) to expected (E) deaths (multiplied by 100), i.e.

$$SMR = \frac{O}{E} \times 100 .$$

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Table 8

Categories of Asbestos Products and Their Distinguishing Characteristics as Manufactured in the Asbestos Products Plants Under Study

Product	Type of Asbestos	Percentage Asbestos	Other Ingredients
Asbestos Insulations	Amosite & Chrysotile	10 to 15	Cristobalite Silica
Asbestos Cement Products	Chrysotile	25 to 40	Quartz Silica
Transite Pipe	Chrysotile Crocidolite	15 3	Quartz Silica
Asbestos Packings	Chrysotile	90 to 100	None
Asbestos Friction Materials	Chrysotile	40 to 80	Rubber & Resins
Asbestos Floor Tile	Chrysotile	15 to 30	Resins
Asbestos Paper and Pipe Covering (low pressure - air cell)	Chrysotile	90	Filler
Asbestos Textiles & Asbestos Fire Felt	Chrysotile	100	None
	Amosite Chrysotile	40 60	None

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The observed deaths are the actual deaths which occurred among the retirees under study between July 1, 1961 and December 31, 1967. The expected deaths are those which would be anticipated if the retirees were subject to the schedule of age-cause specific death rates for the white male population of the United States during the same period of observation.

The procedure for the computation of expected deaths began compiling person-years of observation (PYR) by attained age and by calendar period in a five by five table as shown in Figure 3. Here, person-years are terminated in the middle of the month of death.

Mortality rates among U.S. white males by cause and by age group for the years 1945, 1950, 1955, 1960, and 1965 were used as estimates of the corresponding average annual mortality rates during each of the five calendar periods shown in Figure 3. The expected deaths (E_A) from cause A was then computed by multiplying each of the 25 person-years values from the table in Figure 3 by the corresponding mortality rate ($_AR_{ij}$) among U.S. white males and then summing these products, i.e.

$$E_A = \sum_{i=1}^{5} \sum_{j=1}^{5} {}_AR_{ij} \, (PYR)_{ij} \, .$$

The mortality rates needed to compute expected deaths had to be calculated directly from the number of deaths which occurred among white males in each of the 5 age groups during each of the 5 calendar years. Such figures are published by the National Center for Health Statistics.[17-21] Enumeration of the corresponding U.S. white male

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AGE	CALENDAR PERIOD				
	1941-47	1948-52	1953-57	1958-62	1963-67
65-69	PYR(1,1)	PYR(1,2)	PYR(1,3)	PYR(1,4)	PYR(1,5)
70-74	PYR(2,1)	PYR(2,2)	PYR(2,3)	PYR(2,4)	PYR(2,5)
75-79	PYR(3,1)	PYR(3,2)	PYR(3,3)	PYR(3,4)	PYR(3,5)
80-84	PYR(4,1)	PYR(4,2)	PYR(4,3)	PYR(4,4)	PYR(4,5)
85 & over	PYR(5,1)	PYR(5,2)	PYR(5,3)	PYR(5,4)	PYR(5,5)

Figure 3. Schematic Representation of How Person-Years Were Compiled for the Retiree Population.

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population in each of these age-calendar year categories was from census figures for 1950 and 1960 while intercensal estimates were used for 1945, 1955, and 1965.[22, 23]

The cause-specific mortality rates for 1945 which were used as estimates of the average annual cause-specific mortality rates during the period 1941-47 are based on deaths which have been coded according to the Fifth Revision of the ICD. However, the causes of death among the retirees under study who expired during 1941-47 have been coded according to the Seventh Revision of the ICD. This introduces a slight bias into the results for certain causes of death because the manner of selecting the underlying cause of death changed from the Fifth Revision to the Seventh Revision. The causes most affected in this study are vascular lesions affecting the central nervous system (330-334), all forms of heart disease (400-443), in particular, coronary heart disease (420), and diseases of the respiratory system (470-527). However, coding of cancer deaths (140-209) was only slightly affected by the change in revisions. Furthermore, the scope of the study is such that only 4 per cent of the observed deaths and only 6 per cent of the person-years occurred in the period 1941-47 and so minimal effects are felt on the overall mortality from specific causes.

Although race was to be coded as part of the relevant information for each retiree, complete data on this item was available only for those retirees who had died during the period of observation. This was

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because only the death certificate contained the information. Tabulation of the deceased retirees by race showed that of the 664 retirees who had expired prior to January 1, 1968 only 27 or about 4 per cent were non-white. It was thus decided that use of rates for white males in the U.S. would be acceptable and not lead to any serious biases in the results. Details on the causes of death of these 27 non-white retirees are contained in Table 1, Appendix A.

/ a SMR based on a small number of observed deaths is subject to large variability and should be interpreted with caution. The usual method of judging this variability is to relate the observed number of deaths to a known probability distribution. The follow-up of each retiree can be considered as a 'trial' and on each of these trials there are only two outcomes: the man dies before the close of observation or he does not. Clearly, the outcome on any one 'trial' is independent of the outcome on any other 'trial'. If the simplifying assumption is made that each retiree has the same probability of dying (before the close of observation) then the observed number of deaths can be considered as a binomial variable. Reference to the binomial distribution will then yield 'exact' confidence intervals and/or significance factors for judging whether or not the discrepancy between observed and expected deaths might have arisen by chance.

When the probability of dying is small (say, less than 10 per cent) the Poisson distribution is a good approximation to the binomial. Butler and Edgerton[24] have tabulated significance factors for an SMR

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both at the 5 per cent and 1 per cent levels where the observed number of deaths is assumed to be a Poisson variable. Based on these tables, SMR's significantly different from 100 at the 5 per cent level have been so designated in the text tables.

In the present study group all of whose members enter observation around age 65 total mortality rates are relatively high, in particular those at ages 75 and over. While the Poisson approximation may not be as appropriate in such a situation its use leads to only conservative inferences. In approximating a binomial variable the Poisson estimate actually results in fewer cases of a statistically significant result than would occur if the exact procedure was routinely used.

The SMR has certain distinct qualities which make it a useful and illustrative measure of mortality. In using it to analyse the mortality experience of a group of individuals (cases), the following question is implicitly asked: Have the cases experienced the same mortality pattern as the control group chosen for comparison? In most situations it is important to be able to recognise significant departures of the cases from the controls with respect to deaths from all causes and/or certain specific causes. The SMR will readily depict such deviations and their significance can be judged as described above.

It often happens that several distinct groups of cases are being studied simultaneously and comparison of each of these groups with the

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same control group can be done using SMR's. The resulting SMR's will then show which of the several groups of cases experienced significant departures from the control group vis à vis overall mortality or cause-specific mortality. However, this latter situation can pose a methodological problem. If, in addition to simply distinguishing those groups of cases which experienced an excess or deficit in mortality, it is intended to precisely rank the several groups of cases by the magnitude of their SMR's, the effort can be questionable. For example, if three groups of cases show SMR's for a particular disease of 120, 180, and 360 when compared to a suitable control group the ratios 180/120 and 360/180 taken at face value imply that the risk of dying from this disease for the second group of cases is 1½ times that of the first while the risk for the third group of cases is 2 times that of the second. However, as Silcock points out these inferences can be misleading since, for example, the age distributions of the three groups of cases are not controlled in the calculations.[25] For the purpose of such a precise ranking as described here, he proposes the use of a ratio (or ratios) of adjusted mortality rates as a valid comparative measure. These rates can be adjusted for whatever variables the investigator deems pertinent such as age, race, sex, etc.

In the present study it will be necessary to analyse the mortality experience of several retiree subgroups simultaneously; in fact, this will frequently be the case. On the one hand, it is necessary to find those subgroups which exhibit excess mortality from specific causes and those

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interval is then obtained by summing the departmental scores over all departments, i.e.

$$\sum_{i=1}^{n} \sum_{j=0}^{5} f_{ij} \quad \text{where} \quad f_{ij} \text{ [illegible]}$$

and $\sum_{i=1}^{n} \sum_{j=0}^{5} t_{ij} = 10$.

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Such scores were calculated separately for each of the five 10-year age intervals and then these were summed to yield a total unadjusted exposure score which reflected the amount of asbestos dust exposure a man accumulated during his entire employment with the asbestos company.

No exposure score was assigned to those retirees who worked primarily in office jobs. These subjects were all assumed to have an intermittent dust exposure of at most a Level I intensity for the entire length of time they were employed with the asbestos company.

This technique of computing exposure scores is an attempt to measure both length of exposure and intensity of exposure simultaneously. However, in this manner the combination is implicitly treated as the short, intense exposure [illegible] high exposure. For example, if one retiree had worked [illegible] for eight years he would have accumulated an unadjusted score of [illegible]. Another retiree worked for only three years in a Level III environment would also have accumulated an unadjusted score of 24 (3 x 8). This assumption may or may not be realistic in studying the relationship between asbestos dust and disease.

In an attempt to further refine the estimate of dose an adjusted exposure score was also calculated. This was done only for those

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With respect to death from lung cancer, it is known that for the period 1948-1965 mortality rates among U.S. white males for this cause have reached a peak between ages 69 and 74 and show a gradual decrease after age 74.[17-23] However, every member of the study group has already survived to age 65 and this might delay their peak years for lung cancer mortality to possibly the 75-84 age period. If this is so, then it would be misleading to use SMR's in comparing two retiree categories, one of which was followed between ages 65 and 74 while the other was followed between ages 65 and 84. In the latter retiree category, death rates for lung cancer might be increasing with age while the corresponding rates for U.S. white males would be decreasing, thus producing an excess in observed over expected deaths which would not be comparable to the results for the first retiree category.

Whenever two or more retiree categories are compared in the analyses to follow the median year of retirement for each one is shown. This can serve as a guide in interpreting the results. Widely differing medians would imply that the retirement year structures of the categories being compared differ greatly and hence the SMR's must be interpreted with some caution. In most cases median years of retirement are not much different and the SMR's can be judged accordingly.

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V. RESULTS

A. General Mortality Pattern of Retirees

Excluded from all of the following mortality analyses are six normal retirees known to have died before the closing date of the study but for whom the cause of death was not available. Two of these men died outside the U.S. and it was not feasible to obtain copies of their death certificates. Although the other four deaths occurred within the U.S., the particular state in which the death took place was not known. Pertinent data from the work histories of these men is contained in Table 4, Appendix A.

Table 1, Appendix B, gives total deaths and person-years distributed by age and calendar period for the remaining 1,494 retirees. In Table 2 of Appendix B the same information is presented by age and year of retirement. A list of all deaths occurring among the retirees by detailed cause is given in Table 3, Appendix A.

Table 9 shows the collective mortality experience of the 1,494 retirees by cause and age. During the age interval 65-69 (which would correspond to the period shortly after retirement) the retirees experienced deficits in mortality from all other cancer, cerebral vascular lesions, coronary heart disease, and all other causes. This is not surprising in view of the fact that these men had been actively employed just prior to this time period. However, these deficits were offset by

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Table 9

Observed and Expected Deaths Through December 31, 1967, by Cause and Age, Showing Standardized Mortality Ratios (SMR's) for 1,296 Males Who Worked in 11 Asbestos Products Plants and Retired During 1941 - 1966 (Excluding 6 with Unknown Cause of Death)

Cause of Death and International List Number	65 - 69			70 - 74			75 and over			All Ages		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	219	201.4	108.8	218	178.5	122.1*	221	198.9	111.1	658	578.8	113.7*
All Cancer (140 - 205)	47	38.2	123.0	52	31.2	166.7*	44	26.6	165.2*	143	96.1	148.9*
Digestive System (150 - 159)	15	14.6	103.0	23	12.3	187.0*	15	10.7	139.9	53	37.6	141.0*
Lung, Bronchus, Trachea & Pleura (162 - 163)	28	9.1	219.9*	13	6.1	213.3*	13	3.3	397.6*	66	18.5	249.2*
All Other Cancer	12	14.6	82.4	16	12.8	125.0	16	12.6	126.6	44	40.0	110.0
Cerebral Vascular Lesions (330 - 334)	17	18.6	91.3	22	20.6	106.7	21	29.4	71.4	60	68.6	87.4
All Heart Disease (400 - 443)	94	94.6	99.4	87	83.2	104.5	112	92.8	120.7	293	270.7	108.3
Coronary Heart Disease (420)	70	74.7	93.7	68	64.9	104.7	87	69.4	125.4*	225	209.1	107.6
All Other Heart Disease	24	19.8	120.9	19	18.3	103.7	25	23.4	106.7	68	61.6	110.4
Diseases of the Respiratory System (470 - 527)	22	10.1	217.4*	16	9.5	168.0	14	11.6	120.5	52	31.3	166.3*
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	12	-	-	9	-	-	6	-	-	27	-	-
All Other Causes	39	39.8	97.9	41	33.9	120.9	30	38.5	78.0	110	112.2	98.0

*SMR Significantly Different from 100 at 5% Level.

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rather large excesses in deaths from lung cancer and disease of the respiratory system. The excess (22-10.1) in deaths from this latter disease category was entirely due to the 12 deaths from pneumoconiosis and pulmonary fibrosis. This large excess in deaths, so soon after retirement, can be understood more readily if it is kept in mind that the men who died of these causes had to already have had pneumoconiosis or pulmonary fibrosis at retirement.

As the retirees aged they gradually lost some of their initial advantages and less instances of a deficit in mortality occur. For example, their mortality from all heart disease reached a 20 per cent excess at ages over 75 after a slight deficit between ages 65 and 69. Deaths from all cancer also increased among the retirees due mainly to a sharp rise in lung cancer mortality after age 75.

In contrast to these instances of increasing mortality from several causes among the retirees with age is the picture for diseases of the respiratory system. Deaths from these diseases decreased with age reaching a point at ages 75 and over where it was only 20 per cent above that of U.S. white males.

Overall, the retirees experienced significant excess mortality from cancer of the digestive system, cancer of the lung, and diseases of the respiratory system. With respect to this latter category of diseases, the observed excess (32-31.3) was entirely due to deaths from pneumoconiosis and pulmonary fibrosis.

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At this point it is important to point out that of the 57 retirees in Table 6 who were reported as having pneumoconiosis at first employment with the asbestos company, four died of pneumoconiosis or pulmonary fibrosis and three died of lung cancer. It is possible that occupational exposures not accounted for in the present study might have been the underlying reasons for these deaths. On the other hand, exposure to asbestos dust as defined in this report could have been the necessary complicating factor which resulted in these deaths. At any rate, it would be incorrect to attribute these seven deaths as solely due to occupational exposures at the present asbestos company.

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B. Mortality in Terms of Usual Occupation

There were nineteen retirees for whom no work history was available so that these men could not be classified by usual occupation. For one of them the cause of death was not known and he has already been eliminated from all analyses. The remaining 18 retirees are excluded both from the study of mortality in terms of usual occupation and the set of subsequent analyses. All of these individuals had died before the closing date of the study. Details on their causes of death and other personal data are included in Table 3, Appendix A.

There remain 1,276 retirees for whom an analysis by usual occupation is possible. Of this number 797 worked primarily in

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production jobs, 341 in maintenance-service jobs, and 157 in office and miscellaneous positions. Table 10 shows the mortality experience of each of these occupational groups for somewhat broader cause of death categories than in the previous table. The median year of retirement for retirees in each of these groups indicates that production and maintenance-service retirees are quite comparable in terms of mortality.

Both production and maintenance-service retirees exhibited excess mortality from all causes which was about 13 per cent above the U.S. experience. On the other hand, office retirees experienced approximately the same overall mortality pattern as U.S. white males. The most striking feature of this analysis is the sharp contrast between production retirees and maintenance-service retirees with respect to deaths from lung cancer and diseases of the respiratory system. While both groups experienced significantly high risks from lung cancer, the risk for maintenance-service retirees was much greater than that for production retirees.

The reverse was true for diseases of the respiratory system where production retirees experienced a two-fold excess in deaths from these causes while maintenance-service retirees enjoyed a slight deficit. Again the excess in deaths from respiratory diseases for production retirees was entirely due to deaths from pneumoconiosis and pulmonary fibrosis. A comparison of the results for this disease category in Table 9 with those for the same category in Table 10 for

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Table 10

Observed and Expected Deaths Through December 31, 1967, by Cause and Usual Occupation, Showing Standardized Mortality Ratios (SMR's) for 1,276 Males Who Worked in 11 Asbestos Products Plants And Retired During 1941 - 1966 (Excluding 18 with Unknown Usual Occupation)

Cause of Death and International List Number	Production			Maintenance-Service			Office & Other		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	610	364.5	112.5*	170	149.5	113.7	60	59.5	100.9
All Cancer (140 - 205)	78	60.3	129.3*	47	25.1	186.9*	15	9.8	153.6
Digestive System (150 - 159)	29	23.7	122.6	16	9.8	163.8	7	3.8	185.4
Lung, Bronchus, Trachea & Pleura (162 - 163)	20	11.5	173.9*	22	5.0	444.0*	4	1.9	209.3
All Other Cancer	29	25.2	115.2	9	10.4	86.3	4	4.1	98.1
Diseases of the Respiratory System (470 - 527)	41	19.6	209.1*	8	8.1	98.5	3	3.3	90.6
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	23	-	-	3	-	-	1	-	-
All Other Causes	231	284.6	102.3	115	116.3	98.9	47	46.4	90.5
Median Year of Retirement	1956			1957			1959		

*SMR Significantly Different From 100 at 5% Level.

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production retirees indicates that the original excess in mortality from respiratory diseases observed for all retirees is confined to those men who worked primarily in production jobs.

C. Mortality in Terms of Total Unadjusted Exposure Score

Analysing mortality patterns of the retirees in terms of total unadjusted exposure score began with grouping the subjects into meaningful categories of exposure score. From Tables 2 and 4 it is estimated that, on the average, retirees had worked about 25 years with the asbestos products company prior to their retirement. This figure was considered as a hypothetical working lifetime of asbestos dust exposure for each retiree. Together with the three numerical values (1, 3, 8) used to weight asbestos dust exposure Levels I to III, it was used to define four categories to total unadjusted exposure score.

A man who worked each of 25 years at a Level I asbestos dust exposure would accumulate an unadjusted exposure score of 25 (25 x 1). This was designated as the working lifetime upper limit for exposure scores in the lowest category. Under this definition a person might have worked for only 3 years, each of which was at a Level III asbestos dust exposure, and consequently accumulate an unadjusted exposure score of 24 (3 x 8). This would qualify him to enter the lowest category of exposure score. On the other hand, another individual might have worked each of 48 years at a Level I asbestos dust exposure resulting

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in an unadjusted exposure score of 40 (40 x 1). Such a person would be assigned to a higher category of exposure score.

If each of the 25 years was spent at a Level II asbestos dust exposure the resulting unadjusted exposure score would be 75 (25 x 3). This was designated as the working lifetime upper limit for exposure scores in the next highest category of total unadjusted exposure score. The above example of a man who accumulated an exposure score of 40 over 40 years would fall into this category as well as an individual who worked each of 10 years at a Level II asbestos dust exposure.

A total unadjusted exposure score of 200 (25 x 8) would be accumulated when the entire 25 years were spent at a Level III asbestos dust exposure. This was designated as the working lifetime upper limit for exposure scores in the next highest category of total unadjusted exposure score. A person who spent his entire working lifetime (50 years) at a Level II asbestos dust exposure would accumulate an exposure score of 150 (50 x 3) and qualify to enter this category. At the same time another individual who worked for 10 years at a Level III asbestos dust exposure would accumulate an exposure score of 80 (10 x 8) and also qualify to enter this category.

The fourth and highest category of unadjusted exposure score consisted of all those retirees who had accumulated an exposure score of 200 or more. An unadjusted exposure score in this range could not be achieved unless some time had been spent at a Level III or higher asbestos dust exposure.

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The four categories of total unadjusted exposure score used in the following mortality analyses are then: 0-24, 25-74, 75-199, 200 and over.

The 138 retirees who worked primarily in Office and miscellaneous positions technically qualified to be included in the lowest unadjusted exposure score category (0-24). However, they have been excluded from the results in this section since this particular group subjects might well differ from production and maintenance-service retirees with respect to certain factors affecting mortality, e.g. socio-economic status, smoking habits, and place of birth. These subjects have already been reported on as a group in Table 10 so that the completeness of the study is not affected. Moreover, by adding the observed and expected numbers of deaths by cause for the Office retirees to those for production and maintenance-service retirees in the lowest exposure score category, SMR's can easily be derived for the lowest score category inclusive of Office retirees.

Also excluded from the results in this section are 78 retirees whose work experience with the asbestos company was mainly in the asphalt roofing departments of the various plants. The environment of these areas has been described above and it was felt that these subjects were not appropriate for this phase of the study.

There remain 1,060 retirees who worked primarily in either production jobs or maintenance-service jobs for whom an analysis by total unadjusted exposure score is presented in this section. Table 11

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C. R. MAHIN TRIAL JUDGE
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Table 11

Distribution of 1,060 Retirees Who Worked Primarily in Production or Maintenance-Service Jobs By Age at First Employment with the Asbestos Company And Total Unadjusted Exposure Score (Excludes 78 Who Worked in Asphalt Roofing Departments)

Age at First Employment	Total Unadjusted Exposure Score									
	All Scores		0 - 24		25 - 74		75 - 199		200 & over	
	No.	%	No.	%	No.	%	No.	%	No.	%
15 - 64	1060	100.0	249	100.0	320	100.0	348	100.0	143	100.0
15 - 24	71	6.7	9	3.6	23	7.2	14	4.0	25	17.5
25 - 34	261	24.6	22	8.8	79	24.7	97	27.9	63	44.0
35 - 44	363	34.2	81	32.6	102	31.9	134	38.5	46	32.2
45 - 54	290	27.4	91	36.5	90	28.1	100	28.7	9	6.3
55 - 64	75	7.1	46	18.5	26	8.1	3	0.9	0	0.0
Mean Age at First Employment	40.3		45.7		40.5		39.5		32.7	

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shows the distribution of these retirees by age at first employment with the asbestos company and total unadjusted exposure score. It can be seen that there is a negative association between these two variables. Men entering employment with the asbestos company at the younger ages and who remain there until retirement have a much greater chance of accumulating large exposure scores than men entering employment at the older ages. Conversely, those retirees who accumulated relatively high exposure scores are most likely the ones who began employment with the asbestos company during the younger ages while those retirees who accumulated relatively low exposure scores are most likely the ones who began employment during the older ages.

The percentage distribution in Table 11 has been presented so as to most readily illustrate the second phenomenon. For example, of the 143 retirees in Table 11 who accumulated an exposure score of 200 or more approximately 62 per cent began their employment with the asbestos company between the ages 15 and 34. On the other hand, of the 249 retirees who accumulated an exposure score of 24 or less, 55 per cent began their employment with the asbestos company between the ages 45 and 64.

The reason for displaying the percentage distributions in Table 11 by age at first employment with the asbestos company within each of the four exposure score categories rather than vice-versa is that exposure score category is the variable under study in the present section. Age at first employment with the asbestos company is not the variable

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of primary interest here, but can be of help in interpreting a comparative mortality analysis of unadjusted exposure score.

Table 12 shows the distribution by category of unadjusted exposure score for the 1,060 retirees under examination in this section, production retirees alone, and maintenance-service retirees alone. It can be seen that the biggest disparity between production and maintenance-service retirees with respect to exposure score occurred in the 25-74 category where there were about 14 per cent more production retirees than maintenance-service retirees. Overall, there were about 8 per cent more maintenance-service retirees in the higher categories of unadjusted exposure score (75 and over) than production retirees.

Tables 13-15 show observed and expected deaths by category of unadjusted exposure score for 1,060 production and maintenance-service retirees combined, 721 production retirees, and 339 maintenance-service retirees respectively. Table 12 can be used as a reference to establish the number of retirees at risk in each of the various categories. In many instances the number of observed deaths are small and consequently the ratios must be interpreted with some caution. As in previous tables, SMR's significantly different from 100 have been so designated, but what is of primary interest here is the trend of SMR's rather than their absolute values.

In Table 13 for production and maintenance-service retirees combined the median years of retirement in each of the exposure score

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Table 12

Distribution of 1,060 Retirees Who Worked Primarily in Production or Maintenance-Service Jobs by Usual Occupation and Total Unadjusted Exposure Score (Excludes 78 Who Worked in Asphalt Roofing Departments)

Total Unadjusted Exposure Score	Total		Production		Maintenance - Service	
	Number	%	Number	%	Number	%
All Scores	1,060	100.0	721	100.0	339	100.0
0 - 24	249	23.5	156	21.6	93	27.4
25 - 74	320	30.2	249	34.5	71	20.9
75 - 199	348	32.8	222	30.9	126	37.2
200 and over	143	13.5	94	13.0	49	14.5

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Table 13

Observed and Expected Deaths Through December 31, 1967, by Cause and Total Unadjusted Exposure Score, Showing Standardized Mortality Ratios (SMR's) for 1,060 Males Who Worked Primarily in Production or Maintenance-Service Jobs in 11 Asbestos Products Plants and Retired During 1941 - 1946 (Excludes 78 Who Worked in Asphalt Roofing Departments)

Cause of Death and International List Number	0 - 24			25 - 74			75 - 199			200 & over		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	126	133.6	94.3	150	144.8	103.6	171	139.0	123.0*	86	57.2	150.2*
All Cancer (140 - 205)	26	21.5	120.9	28	23.9	117.3	44	23.7	185.4*	21	9.9	211.9*
Digestive System (150 - 159)	9	8.6	104.3	12	9.3	129.6	14	9.1	153.3	7	3.8	182.0
Lung, Bronchus, Trachea & Pleura (162 - 163)	9	3.8	238.0*	8	4.7	172.0	13	4.8	268.2*	10	2.0	500.0*
All Other Cancer	8	9.1	87.9	8	10.8	80.3	17	9.8	174.3*	4	4.1	98.4
Diseases of the Respiratory System (470 - 527)	8	7.0	114.2	9	8.0	112.9	12	7.6	157.6	14	3.1	459.0*
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	3	-	-	3	-	-	6	-	-	11	-	-
All Other Causes	92	105.0	87.6	113	113.0	100.0	115	107.7	106.8	51	44.3	115.2
Median Year of Retirement	1955			[illegible]			1957			1955		

*SMR significantly Different from 100 at 5% Level.

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categories are not much different and comparisons among these categories should not lead to any serious bias. Overall cancer SMR's tended to rise from a slight deficit in the lowest category of unadjusted exposure score to a 50 per cent excess in the highest score category. Among these retirees mortality from all cancer also increased. The rise in cancer of the digestive system was roughly consistent with the increase for all cancer. Deaths from lung cancer were higher than those expected in each exposure score category, reaching a five-fold excess in the highest score category. The somewhat large SMR for this cause among retirees accumulating an unadjusted exposure score below 24 is somewhat puzzling and is certainly out of line in an otherwise increasing trend in mortality. SMR's for the category "all other cancer" show no particular trend except that a consistent deficit in deaths from these causes is broken by the significant excess in the 75-199 score category. The pattern for diseases of the respiratory system shows a plateau for SMR's in the two lowest exposure score categories after which a sharp increase occurs with the observed mortality over four and one-half times the expected in the highest score category. Excess deaths from these causes in the two highest categories of exposure score were entirely due to pneumoconiosis and pulmonary fibrosis. After excluding cancer and respiratory diseases, SMR's for all other causes exhibited an increasing trend though not as sharp as the one noted for all causes.

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From Table 10 it was seen that the risk of dying from respiratory diseases among the retirees was mostly confined to those who worked primarily in production jobs. In Table 14 these retirees are studied with respect to unadjusted exposure score. In this instance, a discrepancy of three to four years in the median years of retirement occurs. The mortality in these score categories would be quite comparable as would the lowest with the highest. However, overall comparisons among all four categories might seem inappropriate. In this respect it could be argued that the consistent upward trend in the four SMR's (all causes) may not be the true case. For example, the apparent high mortality from all causes in the "200 and over" score category (SMR=153.3) as compared to the relatively low SMR (109.2) in the "25-74" category of exposure score might be due to an artifact in the data. Specifically, the 1937 median retirement year for the latter group of retirees seems to indicate that, on the average, these men had not aged as much as the former group of retirees (median retirement year=1934). Hence, the observed difference in SMR's might well be due to an older group of subjects being compared to a younger group. Such an objection might be overruled, however, by observing that for the two pairs of exposure score categories that are comparable the trend in rising SMR's with increasing exposure score is clearly evident. In any case, it will be sufficient to discern these broad patterns of mortality which may

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Table 14

Observed and Expected Deaths Through December 31, 1967, by Cause and Total Unadjusted Exposure Score, Showing Standardized Mortality Ratios (SMR's) for 721 Males Who Worked Primarily in Production Jobs in 11 Asbestos Products Plants and Retired During 1941 - 1966 (Excludes 76 Who Worked in Asphalt Roofing Departments)

Cause of Death and International List Number	0 - 24			25 - 74			75 - 199			200 & over		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	80	87.8	91.1	119	113.1	105.2	107	86.1	124.2*	59	38.5	153.3*
All Cancer (140 - 205)	16	14.0	113.9	22	18.6	118.0	24	14.7	163.5*	11	6.6	167.0
Digestive System (150 - 159)	4	5.7	70.6	11	7.2	152.0	7	5.6	124.2	4	2.6	154.8
Resp. Branches, Trachea Pleura (162 - 163)	5	2.4	208.1	4	3.6	109.9	6	3.0	199.3	3	1.3	232.9
Other Cancer	7	6.0	117.2	7	7.8	90.1	11	6.0	182.5	4	2.7	147.3
Diseases of the Respiratory System (470 - 527)	6	4.6	131.3	9	6.2	144.5	7	4.7	148.0	13	2.0	646.8*
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	2	-	-	3	-	-	5	-	-	10	-	-
All Other Causes	58	69.2	83.8	88	88.3	99.7	76	66.7	113.9	35	29.9	117.1
Median Year of Retirement	1953			1957			1957			1954		

*SMR Significantly Different from 100 at 5% Level.

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Since these results deal with a smaller subset of the data observed deaths from some causes will be quite small and this could make trends difficult to establish. Increasing SMR's for all causes in production retirees closely matches that seen in the combined group of retirees. SMR's for all cancer in production retirees increase steadily as before but the trend previously noted for cancer of the digestive system is not as clear. The picture for lung cancer is again somewhat ambigious with the persistence of a large SMR in the lowest score category. Despite the small number of observed deaths SMR's in the two highest score categories suggest elevated mortality among production retirees from this cause. SMR's for diseases of the respiratory system increased quite sharply in the highest exposure score category revealing a six-fold increase in observed over expected deaths. This excess as well as the more moderate ones in the other three categories were entirely due to deaths from pneumoconiosis and pulmonary fibrosis.

In Table 10 it was seen that the risk of dying from lung cancer among the retirees was mostly confined to those who worked primarily in maintenance-service jobs. Table 15 shows the results in terms of total unadjusted exposure score for this group. Median years of retirement are not much different here and comparisons should be quite valid. For all causes SMR's again tended to rise with exposure score category - a consistency which is quite striking. With this smaller subset of the data observed deaths again are quite small for

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Table 15

Observed and Expected Deaths Through December 31, 1967, by Cause and Total Unadjusted Exposure Score, Showing Standardized Mortality Ratios (SMR's) for 339 Males Who Worked Primarily in Maintenance-Service Jobs in 11 Asbestos Products Plants and Retired During 1941-1966 (Excludes 2 Who Worked in Asphalt Roofing Departments)

Cause of Death and International List Number	0 - 24			25 - 74			75 - 199			200 & over		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	46	45.7	100.6	31	31.7	97.8	64	52.9	121.0	27	18.8	143.9
All Cancer (140 - 205)	10	7.5	134.0	6	5.2	114.9	20	9.1	220.8*	10	3.3	300.8*
Digestive System (150 - 159)	5	3.0	168.9	1	2.0	49.5	7	3.5	200.3	3	1.3	237.5
Lung, Bronchus, Trachea & Pleura (162 - 163)	4	1.4	290.3	4	1.0	396.0*	7	1.8	381.3*	7	0.7	983.1*
All Other Cancer	1	3.1	32.0	1	2.2	45.6	6	3.7	161.0	0	1.3	0.0
Diseases of the Respiratory System (470 - 527)	2	2.4	82.2	0	1.7	0.0	5	2.9	173.4	1	1.0	96.2
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	1	-	-	0	-	-	1	-	-	1	-	-
All other causes	34	35.8	94.8	25	24.7	101.0	39	41.0	95.2	16	14.4	111.1
Median Year of Retirement	1956			1958			1957			1957		

*SMR Significantly Different from 100 at 5% Level.

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the specific causes. However, quite a sharp increase in the SMR s for all cancer is clearly evident. This rapid rise is mostly due to lung cancer where SMR s for all categories of exposure score ran quite high. In the highest category alone the observed mortality is almost ten times the expected. The persistence of such a high SMR in the lowest exposure score category for maintenance-service retirees would not seem to fit the general pattern. A weaker trend for cancer of the digestive system is noticeable although the observed numbers of deaths are small. It has already been seen that there is no excess risk in mortality from respiratory diseases among maintenance-service retirees. This disease category is included in the present analysis mainly for the sake of completeness although the numbers of observed deaths are quite small.

A comparison of the two highest categories of adjusted exposure score in Tables 14 and 15 indicates that for all cancer, cancer of the digestive system, and cancer of the lung, maintenance-service retirees experienced greater excesses in mortality than did production retirees.

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D. Mortality in Terms of Total Adjusted Exposure Score and Age at First Employment

In Table 11 it was seen that most of the production and maintenance-service retirees who accumulated adjusted exposure scores over 75 began work in the asbestos company during the younger

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ages. At the same time those who accumulated unadjusted exposure scores under 75 tended to have begun their employment with the company at the older ages. This means that in analyzing mortality patterns by total unadjusted exposure score such as was done in Tables 13-15 the variable of interest (score) is confounded with the variable age at first employment. This confounding variable may be of interest in its own right. If age at first employment can be interpreted as age at first exposure to asbestos dust then this variable is directly proportional to time since first exposure for members of this study group since almost every retiree enters the observation period at the same age, viz. 65. It may be that the biologic reaction to asbestos dust differs with the time since first exposure or incubation period. Thus, the response to total amount of dust shown in Tables 13-15 may be simply a reflection of this latent period. Studying the variables total unadjusted exposure score and age at first employment simultaneously could, to a certain degree, separate the effect of dose from time since first exposure. The problem can then be considered from two points of view. Starting with two or more groups of retirees, each of which is relatively homogeneous with respect to age at first employment the effect of increasing dose can be examined. Conversely, for a given category of amount of exposure, the effect of time since first exposure can be studied.

Table 16 presents some results on this issue for the 1,040 retirees who worked primarily in production or maintenance-service

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Table 16

LUNG CANCER

	15 - 39				40 - 64			
	Pop.	Obs.	Exp.	SMR	Pop.	Obs.	Exp.	SMR
0 - 24	90	2	0.7	292.4	190	7	3.1	226.0
25 - 74	199	4	2.0	244.0	169	3	2.4	119.3
75 - 199	179	4	2.4	167.0	169	9	2.4	367.0
200 and over	111	0	1.7	432.9	29	1	0.3	322.6

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jobs in terms of mortality from lung cancer. Here, only two broad categories of age at first employment are used since the number of lung cancer deaths available for analysis is so limited. It can be seen that the curvature previously noted in the two lowest exposure score categories (Table 13) are chiefly confined to retirees who began their asbestos exposure at younger ages, suggesting that for low dose time since first exposure is an important variable. Furthermore, the excesses exhibited in retirees exposed at relatively high exposure scores (7+ unit score) are maintained for both those first exposed early and those first exposed late in their working lifetime. This may indicate that, at least in such a retired population, heavy amounts of asbestos exposure increase the risk of dying from lung cancer independently of time since first exposure.

In Table 16 one of the seven deaths in the 40-44, 0-24 age-score category was of a man who had gone from first employment with the asbestos company and another of these deaths was of a man who had had previous asbestos exposure. Such circumstances could lead to an overstatement of the risk of dying from lung cancer in the age-score category of retirees if these previous events were to [illegible] for the two lung cancers in question.

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Table 17 shows the mortality experience from respiratory diseases (470-527) for 721 retirees who worked primarily in production jobs by age at first employment with the asbestos company and total unadjusted exposure score. It can be seen that the large excess in

Table 17

RESPIRATORY DISEASES

	15 - 39				40 - 64			
	Pop.	Obs.	Exp.	SMR	Pop.	Obs.	Exp.	SMR
0 - 24	25	1(0)	0.6	163.9	131	9(2)	4.0	126.3
25 - 74	116	3(1)	2.2	137.6	133	6(2)	4.1	169.1
75 - 199	119	9(4)	2.1	238.1	104	2(1)	2.6	76.0
200 and over	73	11(8)	1.5	733.3*	21	2(2)	0.9	392.2

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deaths from these causes noted for the highest exposure score categories (Table 14) has been mainly confined to those production retirees who began employment with the company before the age of 40. One of the two deaths in the "11-44, 200 and over" age-score category was of a man who had pneumoconiosis at first employment with the asbestos company. Consequently, the results for this age-score category of retirees might be overstated.

Comparisons of the results shown in Tables 16 and 17 would seem to indicate that the risk of dying from lung cancer among the retirees is less dependent on any particular combination of total unadjusted exposure score and age at first employment with the asbestos company than is risk of dying from respiratory diseases. For the latter risk of death both a high score and a long-term exposure (reflected by a young age at first employment) are indicated as prerequisites for increased mortality among the retirees.

E. Mortality in Terms of Type of Asbestos Products

In analysis of mortality by "type of asbestos products" it was decided to exclude any retiree who worked primarily in maintenance-service or office jobs. The majority of retirees from these occupations simply could not be classified by "type of asbestos products" since department titles did not appear on their work histories. Moreover, it became apparent that most retirees from office and maintenance-

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service jobs for whom department titles were known had worked in the asbestos cement division of the company. This tendency might well have been true for all men in these types of jobs or may have been peculiar to those having department titles in their work histories. The latter possibility could introduce a bias in the present analysis by adding retirees to the asbestos cement group which would be disproportionate to this group's true representation in the present study population. This bias might well be serious because of the very high mortality from lung cancer seen previously in maintenance-service retirees (Table 10). Improper or incomplete allocation of these subjects to categories of type of asbestos products could distort comparative lung cancer mortality among these categories.

Of the 797 retirees who worked primarily in production jobs, 702 could be classified into one of the five categories of type of asbestos products shown in Table 8. The remaining 95 production retirees consisted of 76 who worked in asphalt roofing departments and 19 who worked in miscellaneous product lines.

Table 16 shows the distribution of the 702 retirees by type of asbestos products and total unadjusted exposure score. It should be remembered here that assignment of a man to one of the five asbestos product categories does not necessarily imply that his entire work experience with the asbestos company was confined to departments within that particular asbestos product division. In many cases retirees had worked in two or more of the five categories of asbestos

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Table 18

Distribution of 702 Retirees Who Worked Primarily in Production Jobs By Type of Asbestos Products and Total Unadjusted Exposure Score (Excludes 76 Who Worked in Asphalt Roofing Departments and 19 Who Worked in Miscellaneous Product Lines)

Total Unadjusted Exposure Score	Total		Asbestos Insulation Products		Asbestos Cement Products		Asbestos Packings & Friction Materials		Asbestos Paper & Pipe Covering		Asbestos Textiles & Fire Felt	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
All Scores	702	100.0	137	100.0	264	100.0	130	100.0	98	100.0	73	100.0
0 - 24	139	19.8	16	11.7	43	16.3	41	31.5	38	38.8	1	1.4
25 - 74	247	35.2	59	43.1	88	33.3	54	41.6	35	35.7	11	15.1
75 - 199	222	31.6	41	29.9	104	39.4	32	24.6	17	17.3	28	38.4
200 and over	94	13.4	21	15.3	29	11.0	3	2.3	8	8.2	33	45.1

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products. In these situations assignment to a particular category was based on the total unadjusted exposure score accumulated in each category the one with the highest score being chosen.

It may be seen from this table that retirees from asbestos cement products predominate, being almost twice in numbers to the next largest group. The category with the smallest representation is textiles and fire felt. With regard to this last category, of the 73 retirees so classified 61 were actually from textiles and 12 from the fire felt section. Table 7 indicated that asbestos flooring was to be included with packings and friction materials. Only five retirees were found to have had the majority of their exposure in this department and they have been included with 124 retirees from packings and friction materials. However, because of the great preponderance of the latter retirees this category will be denoted simply by asbestos packings and friction materials . In Table 12 retirees from insulations and cement products are seen to be roughly similar in their distribution by total unadjusted exposure score. So too are retirees from packings-friction materials and paper-pipe covering. Retirees from textiles and fire felt, however, are somewhat unique exhibiting a highly skewed distribution toward the higher exposure score. Overall, retirees in these five product categories can be broadly reduced to three levels according to unadjusted exposure score. The highest levels would be occupied by workmen in textiles and fire felt

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followed by retirees from insulations and cement products. The lowest level would consist of those from packings, friction materials, paper and pipe covering.

Table 14 contains an analysis of the mortality experience of retirees in each of the five categories of asbestos products. Median years of retirement differ here up to three years so that strict comparisons may not be warranted. The numbers of observed deaths from specific causes are quite small in some cases and this also makes precise comparisons more difficult. However, certain features are quite striking. The results for retirees in two categories (insulations and packings-friction materials) are very similar. The excess of better than 40 per cent in total deaths among insulation retirees is quite large and is due mainly to deaths from lung cancer, cancer of the digestive system, and diseases of the respiratory system. A significant deficit of 27 per cent in deaths from all causes was observed in retirees from packings and friction materials. The deficit for all cancer, although based on only five observed deaths, is even more pronounced. Somewhat surprising is the result for diseases of the respiratory system where in the absence of elevated mortality from this set of causes three out of the four deaths were due to pneumoconiosis or pulmonary fibrosis. This is for one of the less dusty categories of asbestos products.

The significant PMR for all cancer observed in retirees in the asbestos cement category is due not only to the excesses for lung

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Table 19

Observed and Expected Deaths Through December 31, 1967 by Cause and Type of Asbestos Products, Showing Standardized Mortality Ratios (SMR's) for 702 Males Who Worked Primarily in Production Jobs in 11 Asbestos Products Plants and Retired During 1961 - 1966 (Excludes 19 Who Worked in Miscellaneous Product Lines)

Cause of Death and International List Number	Asbestos Insulation Products			Asbestos Cement Products			Asbestos Packings and Friction Materials		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	85	60.0	141.7*	120	101.0	118.8	55	73.9	74.4*
All Cancer (140 - 205)	19	10.2	186.4*	32	17.1	187.4*	5	11.8	42.3*
Digestive System (150 - 159)	10	4.0	250.9*	10	6.6	151.5	1	4.6	21.6
Lung, Bronchus, Trachea & Pleura (162 - 163)	5	2.0	250.8	6	3.5	173.9	1	2.2	46.0
All Other Cancer	4	4.2	94.9	16	7.0	227.8*	3	5.0	59.9
Diseases of the Respiratory System (470 - 527)	11	3.2	345.7*	9	5.5	163.7	1	4.1	24.1
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	5	-	-	6	-	-	3	-	-
All Other Causes	55	46.6	118.0	79	78.5	100.7	46	58.0	79.3
Median Year of Retirement	1955			1957			1957		

* All Significantly Different From 100 at 5% Level

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Table 19 (continued)

Observed and Expected Deaths Through December 31, 1967 by Cause and Type of Asbestos Products, showing Standardized Mortality Ratios (SMR's) for 782 Males Who Worked Primarily in Production Jobs in 11 Asbestos Products Plants and Retired During 1941 - 1966 (Excludes 19 Who Worked in Miscellaneous Product Lines)

Cause of Death and International List Number	Asbestos Paper and Pipe Covering			Asbestos Textiles and Fire Felt		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	57	47.9	119.1	43	36.4	118.0
Cancer (140 - 205)	9	7.8	115.2	8	5.9	134.7
Digestive System (150 - 159)	2	3.1	64.1	3	2.4	126.7
Lung, Bronchus, Trachea & Pleura (162 - 163)	4	1.4	285.1	2	1.1	186.0
All Other Cancer	3	3.3	91.2	3	2.5	120.2
Diseases of the Respiratory System (470 - 527)	5	2.5	198.9	6	1.9	312.3*
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	2	-	-	4	-	-
All Other Causes	43	37.5	114.6	29	29.6	101.5
Median Year of Retirement	1954			1956		

*SMR Significantly Different From 100 at 5% Level

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cancer and cancer of the digestive system but also to the two-fold excess in deaths from all other cancers which was significant by itself. This latter result which is apparently out of the ordinary considering the previous results for this disease category could be due to chance alone. The [illegible] for lung cancer in retirees in the paper and pipe covering category suggests a possible excess risk for this disease in an asbestos products division which reflects relatively low exposure scores. The most notable result for retirees in the textiles and fire felt category is the three-fold excess in deaths from respiratory diseases which was entirely due to four deaths from pneumoconiosis and pulmonary fibrosis. It is interesting to note that the greatest excesses in deaths from respiratory diseases (both around three-fold) occurred in retirees from asbestos product lines having the least amount of asbestos in the final products (insulations) and in retirees from those product lines having the greatest amount of asbestos in the final products (textiles and fire felt).

F. Mortality in Terms of Total Adjusted Exposure Score

Under the assumption that it is the asbestos fiber, per se, which is most important in the etiology of lung cancer and other diseases among asbestos workers it would be important to quantify the relationship, if one exists, between the amount of asbestos fibers a man has been exposed to and subsequent mortality. The unadjusted exposure

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score used in previous analyses was influenced to a degree by other [illegible] simultaneously with reduction in the working environment. Distribution of an adjusted exposure score has already been described. Unfortunately, these scores could be computed only for retirees who worked primarily in production jobs. The reason for this is [illegible] for classifying only production retirees by type of asbestos products discussed in the previous section.

[illegible] the adjusted exposure score to [illegible] the cause-classification of the 721 [illegible]. The three groupings used previously in the unadjusted scores remained here for adjusted scores for the retirees. That is, there were the obvious standards for defining score-specific groupings in the present case and the other is simply for ease of comparison with the results for corresponding categories of the unadjusted exposure scores. The 176 retirees having a total unadjusted exposure score [illegible] of course, in this same category of adjusted exposure scores. For this category it would be very difficult to distinguish the cause of either score in terms of cause-specific mortality even if large numbers of deaths from these causes were available. For each of the three highest categories of total unadjusted exposure scores, considerable numbers of retirees were displaced into lower categories of [illegible] exposure.

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Table 20

Distribution of 721 Retirees Who Worked Primarily in Production Jobs by Total Unadjusted Exposure Score and Total Adjusted Exposure Score

Total Unadjusted Exposure Score	Total Adjusted Exposure Score									
	All Scores		0 - 24		25 - 74		75 - 199		200 & over	
	No.	%	No.	%	No.	%	No.	%	No.	%
All Scores	721	100.0	335	100.0	252	100.0	96	100.0	38	100.0
0 - 24	156	21.6	156	46.6	0	0.0	0	0.0	0	0.0
25 - 74	249	34.5	144	43.0	105	41.7	0	0.0	0	0.0
75 - 199	222	30.9	35	10.4	116	46.0	71	74.0	0	0.0
200 & over	94	13.0	0	0.0	31	12.3	25	26.0	38	100.0

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Adjusted exposure score is, by derivation, closely related to the type of asbestos products with which a retiree worked. Table 21 illustrates this fact for the 722 of 721 production retirees who could be classified by "type of asbestos products". It can be seen that the majority of retirees in the lowest category of total adjusted exposure score worked primarily in asbestos insulation and asbestos cement products. These two product lines have the lowest percentage of asbestos in the final product but are responsible for relatively high total dust exposures. Most of the remaining retirees in this lowest adjusted score category were probably also in the same unadjusted score category since the products they were chiefly involved with contained relatively high amounts of asbestos. At the other extreme the two highest categories of total adjusted exposure score contain mostly retirees who worked primarily in asbestos packings, friction materials, gaskets, pipe coverings, textiles, or fire felt. It is these product lines which contain the greatest percentage of asbestos in the final products. However, with the exception of asbestos textiles and fire felt total dust exposures in these departments are generally relatively moderate to low. From this table it can be seen that studying the relationship between total adjusted exposure score and cause-specific mortality simultaneously involves the effect of the variable "type of asbestos products".

Table 22 presents the results for 721 production retirees in terms of mortality by category of adjusted exposure score. For all causes [illegible] score. This was also the case

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Table 21

Distribution of 702 Retirees Who Worked Primarily in Production Jobs by Type of Asbestos Products and Total Adjusted Exposure Score
(Excludes 19 Who Worked in Miscellaneous Product Lines)

Type of Asbestos Products	Total Adjusted Exposure Score							
	0 - 24		25 - 74		75 - 199		200 & over	
	No.	%	No.	%	No.	%	No.	%
Total	316	100.0	252	100.0	96	100.0	38	100.0
Asbestos Insulation Products	88	27.8	43	17.1	6	6.3	0	0.0
Asbestos Cement Products	135	42.8	103	40.8	25	26.0	1	2.6
Asbestos Packings & Friction Materials	53	16.8	55	21.8	22	22.9	0	0.0
Asbestos Paper & Pipe Covering	39	12.3	38	15.1	16	16.7	5	13.2
Asbestos Textiles & Fire Felt	1	0.3	13	5.2	27	28.1	32	84.2

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Table 22

Observed and Expected Deaths Through December 31, 1967, by Cause and Total Adjusted Exposure Score, Showing Standardized Mortality Ratios (SMR's) for 721 Males Who Worked Primarily in Production Jobs in 11 Asbestos Products Plants and Retired During 1941-1966

Cause of Death and International List Number	0 - 24			25 - 74			75 - 199			200 & over		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
All Causes	164	157.9	103.9	125	105.0	119.1	50	42.7	117.1	26	20.0	129.7
All Cancer (140 - 205)	37	26.0	142.4	23	17.5	131.1	7	7.1	98.2	6	3.3	182.3
Digestive System (150 - 159)	15	10.2	146.4	5	6.8	73.5	4	2.8	145.3	2	1.3	151.1
Lung, Bronchus, Trachea & Pleura (162 - 163)	9	4.9	184.8	5	3.5	143.8	2	1.4	141.5	2	0.6	343.6
All Other Cancer	13	10.9	119.5	13	7.3	179.0	1	3.0	33.8	2	1.4	144.4
Diseases of the Respiratory System (470 - 527)	12	8.4	142.5	12	5.7	209.7*	5	2.4	211.6	6	1.0	582.9*
Pneumoconiosis & Pulmonary Fibrosis (523, 525)	4	-	-	8	-	-	5	-	-	3	-	-
All Other Causes	115	123.4	93.2	90	81.7	110.1	38	33.2	114.5	14	15.7	89.1
Median Year of Retirement	1956			1957			1956			1954		

*SMR Significantly Different from 100 at 5% Level

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for production retirees in Table 14. However, the gradient for adjusted score is much less sharp than it was for unadjusted score. The results for lung cancer are based on small numbers of observed deaths, particularly in the two highest categories of adjusted exposure score. The high SMR in the 400 and over score category loses significance among the four results for this cause. If this were of any reliability it would indicate that the risk of dying from lung cancer is confined to those men who have experienced high exposures where it was likely that most of the dust consisted of asbestos fibers. The proportional excess of SMR's for diseases of the respiratory system is consistent with a similar trend noted in terms of unadjusted exposure score except that large excesses show up sooner. In Table 14 it was only in the highest category of unadjusted exposure score that a large excess in these deaths occurred. However, a significant excess is shown in the 44-74 adjusted score category and this is maintained and surpassed in the two higher adjusted score categories.

It is informative to understand some of the results for adjusted score in terms of its relationship to type of asbestos products mentioned previously. For example, the SMR for cancer of the digestive system in the 0-44 adjusted score category is much greater than the corresponding SMR for the same category of unadjusted exposure score. In the reallocation of production retirees by adjusted score it can be seen from Table 41 that a considerable number of these in the lowest category of adjusted score worked primarily in asbestos insulations

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and cement products. In Table 19 retirees from these two product lines accounted for [illegible] of the eleven "additional" deaths from these cancers observed in the 0-24 adjusted score category over what was initially found in the same unadjusted score category (Table 16). As a result of this "transfer" of deaths the SMR for cancer of the digestive system in the 25-74 adjusted score category is much lower than the corresponding SMR in the same category of unadjusted score. The appearance of rather high SMR's for diseases of the respiratory system in the middle two categories of adjusted exposure score is a result of reallocation of the men from asbestos insulations and cement products who accumulated high unadjusted exposure scores to these two adjusted exposure score categories.

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VI. DISCUSSION

Although data presented here is based solely on the experience of males aged 65 and over who were no longer employed in the asbestos products industry the results are quite consistent with previous findings for actively employed asbestos products workers with respect to elevated mortality from cancer of the digestive system, lung cancer, and respiratory diseases.

Some investigators in the field of occupational health have commented on the appropriateness of analysing the mortality patterns of survivor groups in the study of industrial populations. One objection which is often raised is that of "selection". By this is meant that the group or cohort under study at a given point in time consists of only those individuals healthy enough to reach that point. What is suggested here is that the more susceptible (to the particular industry-related disease(s) under investigation) persons have previously withdrawn from eligibility for the cohort because of disability, death, and unspecific reasons. In this respect Lloyd has pointed out that if there is an underlying relationship between occupation and cause-specific mortality, the pattern of mortality for survivors may be biased by the occurrence of exposure-related mortality prior to observation.[26] This is probably true for a disease like asbestosis which in the past has caused deaths among asbestos workers more frequently at ages under 65.[9,12] In order to draw an inference as to the relative mortality risk for this disease

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it would be more appropriate to study exposed populations under the age of 65. Surprisingly though, an excess risk for the category of respiratory diseases which includes asbestosis was detected in retirees and was entirely due to pneumoconiosis and pulmonary fibrosis. Furthermore, most of these deaths occurred among retirees who had first been exposed to asbestos dust more than thirty years before retirement (Table 17). However, for a disease such as lung cancer which has characteristically exhibited a long latent period in asbestos workers, observation restricted to ages 65 and over might indeed prove more useful than not. Even in the restricted age span of 65 and over a certain order is evident in terms of deaths from respiratory diseases which include asbestosis and lung cancer. It may be seen from Table 9 that the greatest excess in deaths from the former set of causes (470-527) occurred between ages 65 and 69 while the greatest excess from lung cancer occurred at ages 75 and over.

In this vein it is illustrative, methodologically, to compare the retirees' cause-specific mortality experience with the results of Mancuso and Enterline for asbestos products workers under age 65.[10,11] The excess in deaths from lung cancer noted for retirees was on about the same order as that in Mancuso's subjects and in the asbestos textile workers studied by Enterline. On the other hand, retirees had a much greater risk than did either the workers in asbestos building products or asbestos friction materials in the latter study. The excess in deaths from cancer of the digestive system among retirees was much

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lower than that observed by Mancuso but was quite similar to Enterline's finding in asbestos textile workers. Again the risk of dying from these cancers was greatest among retirees than for workers in either of the other two categories of asbestos products in the latter study. The consistency between results of the present study and the work of Mancuso and Enterline is an example in which a survivor group provided about the same insight into industry-related disease problems as did two groups of active workers.

Of course the magnitude of the increased risk from occupationally related diseases (s) will vary between investigations because of differences in the nature of the studies. These include composition of the cohort with respect to age at start of observation and area of exposure within the industry, length of observation period, age span during which follow-up continues, and selection of a comparison group. Within several studies quoted in Section I the lung cancer mortality ratios ranged from a low of 1.2 to a high of 13.5 times the expected. The risk among retirees is well below that observed in the English studies as well as the results of Selikoff et al. for insulation workers.[7-9]

The study by Selikoff et al. covered mortality experience at ages 35 and over including a significant amount of follow-up at ages over 65.[9] The findings of ... excess almost seven times that expected for lung cancer and a three-fold risk for cancers of the stomach, colon, and rectum combined were substantially greater than

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the corresponding results among retirees. It would be informative to know how the observed excesses for Selikoff's workers were distributed before and after age 65. This would make comparison with the present study more valid.

In Table 9 SMR's for lung cancer among all retirees tended to rise with age indicating that the risk of dying from this disease had increased accordingly. Table 23 shows mortality rates from lung cancer in all retirees and these confirm the impression first gained from SMR's. It can be seen that for each of the two time periods death rates did increase with age. The increase is slightly greater in the earlier period. This situation contrasts with that of all U.S. white males. Mortality rates from lung cancer in the latter population reach a peak between the ages 65-74 and subsequently decrease. Observations among retirees, then, suggest a kind of postponement or delay in this peak until the very advanced ages. Possible explanations for this phenomenon include the relative healthiness of the subjects at the start of observation and the manifestation of a latent period for the disease.

Another way of looking at the pattern of lung cancer mortality in the retirees is by grouping them by year of retirement. This would be similar to establishing generation cohorts since most of the individuals in each group would be 65 at about the same point in time. Table 24 shows the death rates from lung cancer in this way for suitable groupings of retirement years. In this table the 191 disability and early retirees who survived to age 65 have been eliminated. The year in which

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Table .3

Lung Cancer Deaths Through December 31, 1967 by Age And Calendar Period, Showing Mortality Rates Per 10,000 Person-Years for 1,2[illegible] Males [illegible] Worked in 11 Asbestos Products Plants and Retired During 1941 - 1966

Calendar Period	Age		
	All Ages	65 - [illegible]4	75 and over
1941 - 67			
Deaths	46	3[illegible]	[illegible]3
Rate	46.[illegible]	4[illegible].3	[illegible]1.2
1941 - 57			
Deaths	[illegible]	6	[illegible]
Rate	2[illegible].3	17.7	[illegible]6
1958 - 67			
Deaths	38	27	11
Rate	6[illegible].1	5[illegible].7	8[illegible].5

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PROCEEDING NO. 1702

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PROTECTIVE ORDER RE DISCOVERY MATERIALS
MARCH 23, 1983
HON. IRA A. BROWN, JR.
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SUPERIOR COURT OF THE STATE OF CALIFORNIA
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Table 24

Lung Cancer Deaths Through December 31, 1967 by Age And Year of Retirement, Showing Mortality Rates Per 10,000 Person-Years for 1,296 Males Who Worked in 11 Asbestos Products Plants and Retired During 1941 - 1966

YEAR OF RETIREMENT	AGE		
	All Ages	65 - 74	75 and over
1941 - 66			
Deaths	46	33	13
Rate	46.6	41.3	69.2
1941 - 47			
Deaths	6	0	6
Rate	23.3	0.0	56.7
1948 - 52			
Deaths	10	6	4
Rate	48.5	38.7	78.0
1953 - 57			
Deaths	14	11	3
Rate	54.7	48.8	98.0
1958 - 62			
Deaths	9	9	0
Rate	48.5	48.6	0.0
1963 - 66			
Deaths	7	7	0
Rate	85.3	85.3	0.0

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they attained that age, i.e. for this group, year of retirement means year in which age 65 was reached. It may be seen that the earliest cohort (1941-47) had the lowest rate of lung cancer even though it was followed for the longest period of time. Contrastingly, the most recent cohort exhibited the highest rate despite the limited number of years available for observation. The middle three retirement cohorts showed very similar mortality rates from lung cancer which were midway between the rates in the extreme groups. From these data there seems to be no clear connection between the amount of time given for observation and the expected rate of lung cancer which occurs.

In Table 10 the mortality experience of the retirees was analysed according to usual occupation. The three categories which are presented there convey to some extent three general areas of exposure. Production jobs imply a daily, steady exposure whereas maintenance-service jobs involve mainly intermittent exposures which could be very intense on many occasions. Office positions could be considered as no exposure jobs or at most minimal-intermittent. The overall excess in lung cancer deaths observed for the three occupations combined became unequally distributed according to specific occupation. Both the relatively low risk for production retirees and the high risk for maintenance-service retirees are somewhat surprising. It would seem that the SMR in production retirees (174) may not convey the real magnitude of the risk for these particular individuals. However,

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Esterline found even lower SMR's for lung cancer in workers aged 15-64 from asbestos building products and friction materials.[10]

The SMR of 444 in maintenance-service retirees is not really comparable to any published result since no author has looked at these particular occupations within the asbestos products industry. Those investigators who have used Social Security records to establish cohorts of asbestos workers certainly could not distinguish among specific jobs within the industry. In addition, it is not known whether an individual who works as a mill-right or electrician for an asbestos products company is classified as an asbestos worker or separately as a maintenance man. The types of exposures to which these individuals have been subjected are not unlike the ones encountered by Selikoff's insulation workers. Some maintenance-service retirees worked as machinists with relatively low levels of asbestos dust exposure. Others worked as painters, millwrights, and electricians with intermittent but very intense dust exposures.

In studies of the relationship between asbestos dust and disease considerable attention has been directed to the association between asbestosis and lung cancer. Results for maintenance-service retirees may indirectly yield additional information on this question. It can be seen from Table 10 that simultaneously with the four-fold excess in lung cancer deaths this subgroup of retirees experienced no excess in deaths from respiratory [illegible] deaths were due to pneumoconiosis and pulmonary fibrosis. These findings could be used

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to hypothesize that an excess risk of bronchial carcinoma is possible in the absence of asbestosis. Table 4, Appendix A gives the specific jobs held by the 22 maintenance-service retirees who died of lung cancer together with other pertinent data.

Some attention has been given to the belief that there exists a group of "susceptibles" in any industrial population who will respond or react to the occupational environment in terms of developing disease if given sufficient time. In terms of the present study it might be hypothesized that a subgroup of asbestos workers are prone to develop "asbestos-lung cancer" given the right conditions and enough time. Given the present set of results for production and maintenance-service retirees with respect to mortality from lung cancer, the following conjecture might be made. The working environment of "susceptibles" in production jobs is conducive to the development of lung cancer before age 65 leaving relatively few survivors eligible to die of lung cancer in later years. On the other hand, environmental conditions for "susceptibles" in maintenance-service jobs relieves them, somewhat, of this disease before the age of 65, consequently enabling the many survivors to succumb to lung cancer later in life.

At this point it might be well to consider the lung cancer experience of the retirees in the light of several factors which could have influenced it and which have not been taken into consideration as yet. One such factor is cigarette smoking which has been shown to be associated with a high incidence of lung cancer in many reports.

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Selikoff in his original study indirectly showed that cigarette smoking alone did not account for the nearly seven-fold excess in lung cancer deaths.[9] In a later extension of that study he was able to ascertain the smoking habits of all members of the cohort and an excess of the same magnitude was maintained even when smoking habits were taken into consideration.[27] In the latter study no lung cancer deaths occurred among the non-cigarette smokers prompting the suggestion that cigarette smoking and asbestos exposure might act synergistically in the production of lung cancer.

Unfortunately, in the present study information on smoking habits was available from company records for only a small fraction of the retired population. Because of this it was impossible to present results either specific for, or adjusted for this variable. However, it is still reasonable to ask whether the observed excess mortality from lung cancer in the insured is due to differences in their smoking habits from those of the white males. An indirect answer to this question can be provided by comparison of a subset of the present data with that reported on by Hammond for several classes of smokers.[10] Initiated by Dorn in 1952 this smoking study followed-up a group of ... veterans who were holders of U.S. Government Life Insurance. The cohort consisted of 293,658 individuals, almost all of whom were white males in white collar or skilled occupations. The group was subdivided by smoking category and observed [illegible] during the age span 35 to [illegible]

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For [illegible] study it was decided to calculate lung cancer [illegible] person-years and observed lung cancer [illegible] for several classes of smokers. [illegible] retirees that was chosen to calculate [illegible] person-years and lung cancer deaths occurring between [illegible] period 1958 to 1964. This [illegible] interval covered by Mahn's study [illegible] years. Among the retirees of [illegible] in this time interval [illegible] 25 [illegible] for these categories of [illegible]. It can be seen that for the retirees [illegible] to be between the ages by [illegible] smokers of two or more [illegible] if the observed excess in lung cancer [illegible] relatively to their [illegible] smoking [illegible] to all retirees smoking about 2 packs of [illegible] retirees. Such a comparison would indicate that an excess lung cancer [illegible] in retirees cannot be explained in terms of cigarette smoking alone. Lung cancer rates for production retirees [illegible] the corresponding rates for smokers of 10-20 cigarettes per day and smokers of 21-39 cigarettes per day. If the excess lung cancer deaths observed for this group of retirees [illegible] their unusual smoking habits it would be [illegible] smoking about a pack of

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Table 25

Lung Cancer Deaths and Death Rates Per 10,000 Person-Years by Age for 4 Categories of Current Cigarette Smokers, 1954-1962 and 3 Groups of Retirees, 1953-1962

Current Cigarette Smokers	65 - 74	75 - 84
1 - 9/day		
Deaths	44	5
Rate	11.9	26.0
10 - 20/day		
Deaths	239	15
Rate	23.5	38.8
21 - 39/day		
Deaths	194	7
Rate	38.8	55.0
Over 39/day		
Deaths	50	3
Rate	55.9	129.3
All Retirees		
Deaths	19	6
Rate	48.9	70.8
Production Jobs		
Deaths	9	2
Rate	36.3	36.8
Maintenance-Service Jobs		
Deaths	10	3
Rate	95.5	145.8

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cigarettes per day at retirement. It is conceivable that cigarette smoking habits among production retirees were responsible for at least some of their excess lung cancer deaths but definite conclusions are not entirely possible. The situation for maintenance-service retirees, however, is quite striking. Lung cancer rates among these men appear to exceed those of heavy cigarette smokers (over 39/day) and certainly permit the inference that patterns of cigarette smoking in this group of retirees do not explain their excessive risk of lung cancer.

Haenszel has reported on cancer mortality among foreign-born white males residing in 35 states for the year 1950.[14] Among other findings he has noted a significant excess (33%) in observed deaths from lung cancer for total foreign-born white males when compared to native-born white males in the same 35 states. In analysing lung cancer mortality among foreign-born white males from each of 14 countries, he found excesses among the immigrant groups from eight of these countries and deficits among the other four. The rather large proportion of foreign-born among the retiree population has been shown in Table 7. It is possible that this demographic characteristic of the study group may have contributed to the significant excess in lung cancer deaths. Among all U.S. white males aged 65 and over in 1950, 23.7 per cent were foreign-born.[29] In 1960 the corresponding percentage was 21.2.[30] These figures are both less than half of the estimated proportion of foreign-born among the retirees. In this respect the comparison group used in the present study differs markedly from the

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retiree population. Of the 587 retirees known to have been foreign-born, 476 (81.1%) were from the 12 countries studied separately by Haenszel. Of these 476 individuals 375, or 63.9 per cent of all foreign-born retirees, were from the eight countries exhibiting excess lung cancer mortality and 101, or 17.2 per cent of all foreign-born retirees, were from the four countries showing deficits in lung cancer mortality. There was a disparity between production retirees and maintenance-service retirees in the proportion of foreign-born. Among the former group 54.6 per cent were immigrants while 40.0 per cent of the latter group were foreign-born. In an effort to ascertain the effect of this variable on the lung cancer findings presented here, an analysis of the 634 native-born retirees was carried out. SMR's for lung cancer were calculated for the entire U.S. born group as well as for production and maintenance-service retirees separately. It should be recalled that in such an analysis the other extreme with respect to birthplace is reached, i.e. about 30 to 45 per cent of the comparison group is foreign-born while no one in the study group is. The most unbiased results should lie somewhere between the original findings and the ones presented here. Table 46 shows the results for native-born retirees as compared to the original findings for all retirees. Overall, exactly half of the 46 lung cancer deaths occurred in native-born retirees, the proportion in production retirees being much lower than in maintenance-service retirees. It can be seen that for retirees from all occupations the original SMR value is more than maintained. However, SMR's specific for job show

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Table 26

Population and Observed and Expected Deaths from Lung Cancer by Usual Occupation, Showing Standardized Mortality Ratios (SMR's) For All Retirees and Native-Born Retirees

Usual Occupation	All Retirees				Native-Born Only			
	Pop.	Obs.	Exp.	SMR	Pop.	Obs.	Exp.	SMR
All Occupations	1294	46	18.5	249.2	632	23	8.2	278.8
Production Jobs Only	797	20	11.5	173.9	320	5	4.2	119.3
Maintenance-Service Jobs Only	341	22	5.0	444.0	192	14	2.5	555.8

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quite divergent trends. The significant excess for all production retirees has now diminished substantially in the native-born subgroup. On the other hand, the SMR for native-born maintenance-service retirees is even greater than that for all such retirees. It is possible, then, that at least some of the excess in lung cancer deaths observed in production retirees might be due to a demographic factor, viz. birthplace. However, this same factor does not seem to explain the high risk among maintenance-service retirees.

Another factor which should be considered in the interpretation of SMR's for lung cancer is geographic variation in mortality from this cause within the U.S. Although all SMR's presented here are in reference to the entire U.S. white male population the asbestos products plants of interest were located in only six states. Therefore, most of the deaths occurred in these particular states. Gordon et al. have reported on lung cancer mortality among white males in each of the 48 states for the year 1950.[31] They published results in the form of ranking the 48 states by age-adjusted mortality rates. Two of the six states in question fall in the highest quintile and one of these is responsible for a large proportion of all deaths among the retirees. Three other states are in the second highest quintile while the remaining one ranks in the third highest quintile. Such a circumstance highlights another drawback to the use of national mortality data as a means of comparison. In the present study it would seem that lung cancer mortality rates for all U.S. white males are probably lower than the ideal control rates.

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This would tend to overstate the lung cancer risk somewhat. Unfortunately, rates specific for certain combinations of demographic variables are not available on a state by state basis so that the more appropriate figures could not be used.

It has been noted in Table 9 that SMR's for all causes of death were consistently greater than 100 among retirees in general even in the years immediately following retirement. Such a detrimental mortality experience in a group of men who had been actively employed shortly before can be partially explained in terms of the socio-economic structure of the study group as compared to that of the U.S. population. The 135 retirees from office and miscellaneous positions comprise about 10 per cent of all retirees. Among males aged 60-64 (the age group immediately prior to the usual compulsory retirement age) employed in 1950 in the U.S., the percentage of white collar workers which is roughly comparable to this figure was 30 and in 1960 it was 34.[29,30] It is well known that total mortality varies with occupational level, e.g. white collar workers have lower total death rates than do blue collar workers.[32] A priori then it might be expected that U.S. males with their three to one ratio of white collar workers would exhibit a more favorable mortality pattern than the retirees, even in the absence of any occupational hazard.

On this point it is of interest to note that in Table 10 retirees who worked primarily in office jobs (a white collar occupational group) did not experience a more favorable overall mortality than U.S.

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white males despite their apparent advantage in terms of socio-economic status. Excess deaths from lung cancer and gastro-intestinal cancer balanced out the deficits in mortality from other causes. These specific excesses indicate that office retirees might have had significant amounts of asbestos exposure which affected their post-retirement mortality patterns.

It is practically impossible to precisely separate three competing forces which have influenced the overall mortality of the retirees. The first of these is their particular socio-economic structure which has just been discussed. The second is the relative healthiness of this group at time of retirement which was commented on in a previous section. Finally, there is the carry-over effect of the working environment which is really the one that is of primary interest. In attempting to isolate this latter factor total mortality may not be the best indicator because of the first two competing forces. Reliance on cause-specific mortality then becomes necessary.

A noticeable result in the present study is the rather consistent disease-specificity which emerges. By this is meant that increased mortality among the retirees seems to be confined to only those disease categories to which previous evidence has pointed, viz. lung cancer, respiratory diseases and, to a lesser extent, cancer of the digestive system. For example, in Table 9 which shows the mortality pattern of the entire study group by age and cause the deficits in deaths from such degenerative diseases as all other cancer, cerebral vascular

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lesions, and heart disease in the 65-69 age group, are quite remarkable. Although mortality from these causes did increase slightly among the retirees with age the overall results showed observed deaths quite close to what would be expected. In Table 10, where the retirees were classified by usual occupation, this same circumstance persists. Here separate categories for cerebral vascular lesions and heart disease are not shown but these two sets of diseases contribute heavily to the category 'all other causes'. In this latter category it can be seen that observed deaths were consistently quite close to those expected even reaching a 10 per cent deficit among office retirees. Results for 'all other cancer' also followed this same pattern showing at most a 15 per cent excess in production retirees while exhibiting a 14 per cent deficit in maintenance-service retirees.

Berkson has commented on the seeming non-specificity in the association of cigarette smoking and disease.[33] He observes that in several of the prospective studies carried out on this problem there are excesses in deaths among smokers for many disease categories in addition to lung cancer. In view of this, he has suggested that the observed associations may simply be spurious and devoid of etiological meaning. On this point data presented here would appear to be free of such complicating features.

In Tables 13-15 where mortality by unadjusted exposure score was examined the results might have been affected by a particular kind of systematic error. It is possible that early periods of employment

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with the asbestos company were not recorded on the survey form for some retirees because of missing or incomplete employment records at the individual plants. This would be reflected in more men beginning their employment with the company at older ages than was actually the case. Such a situation would tend to understate asbestos exposure and consequently unadjusted exposure score. If lung cancer mortality does, in fact, increase with amount of asbestos exposure as determined by unadjusted score the pattern of SMR's for this disease over the four score categories would be affected by a misclassification of retirees.

For example, if the 0-24 score category contained a number of retirees for whom a true unadjusted score was much higher, the resulting SMR could be biased upward. That this might indeed be the case is given some plausability by the result in the lowest score category in Table 14 for respiratory diseases. There were 6 observed deaths from these causes, 2 of which were due to pneumoconiosis and pulmonary fibrosis. The latter two deaths, which accounted for the entire excess, occurring in retirees who seemingly had very low exposures are somewhat surprising. In the past these diseases have been associated with much greater amounts of asbestos exposure. Contrastingly, if a number of retirees were omitted from the highest score category due to understating of employment with the asbestos company the SMR might be biased downward.

In addition to the scores used in this report there were two other variables which could have been used to estimate dose, both being

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somewhat cruder. One is age at first employment with the asbestos company. Since almost all of the retirees were removed from further exposure at age 65 this variable would at least determine the length of employment which in turn might be correlated with amount of exposure. Indeed, Table 11 indicated that age at first employment was closely associated with total unadjusted exposure score for production and maintenance-service retirees. The other variable is year of retirement. The reasoning which would lead to use of this estimate of dose is that dust exposures were probably higher the further back in time a man worked. Those individuals retiring in 1961 might then have been exposed, on the average, to higher levels of asbestos dust than those retiring in the 1960's. Table 27 shows the distribution of the retirees by total unadjusted exposure score and year of retirement. It can be seen that for this particular group of men there was no association between these variables and hence use of year of retirement as an estimate of dose would not have been very fruitful.

Among the 558 deaths in the present study for which the death certificate was located three involved the term mesothelioma as the underlying cause. Two were mesotheliomas of the pleura. One of these was coded as malignant (163) probably because metastases to the lung and pericardium were indicated by the attending physician. The other was coded as benign (212) probably because the presence of metastases was not indicated anywhere on the certificate. The third

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Table 27

Distribution of 1,060 Retirees Who Worked Primarily in Production or Maintenance-Service Jobs By Total Unadjusted Exposure Score and Year of Retirement

Total Unadjusted Exposure Score	Year of Retirement									
	1941-47		1948-52		1953-57		1958-62		1963-66	
	No.	%	No.	%	No.	%	No.	%	No.	%
All scores	178	100.0	163	100.0	256	100.0	271	100.0	197	100.0
0 - 24	66	37.1	45	26.8	42	16.4	65	24.0	31	16.6
25 - 74	47	26.4	47	28.0	81	31.6	87	32.1	58	31.0
75 - 199	45	25.3	48	28.5	96	37.5	83	30.6	76	40.6
200 & over	20	11.2	28	16.7	37	14.5	36	13.3	22	11.8

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such case was a mesothelioma of the peritoneal cavity. This was coded as malignant (158) probably because it was accompanied by the phrase generalized carcinomatosis'.

Table 2t contains some information on all deaths occurring among the initial group of 1,735 retirees identified by the asbestos company and referred to in Table 1. The symbol <65 denotes deaths at ages under 65 while the symbol '65+ is meant to indicate deaths at ages 65 and over. The 2 deaths listed under the heading mesothelioma are all those for which this term appeared on the death certificate. In every case it was selected as the underlying cause of death. Interestingly enough, this condition was referred to by six different code numbers of the ICD list (7th Revision). These codes were: 158, 163, 197.9, 211, 212, and 227.

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Table 28

Distribution of Deaths Occurring Between [illegible] and 1967
Among 1,735 Persons Who Retired From an
Asbestos Products Manufacturing Company During 1941-1966,
By Sex, Type of Retirement, and Selected Causes

	Total Deaths	Lung Cancer	Pneumoconiosis and Diff. Fibrosis	Mesothelioma
		Males		
Total	848	67	52	7
Normal	605	42	24	3
Disability and Early	243	25	27	4
<65	184	21	25	4
65+	59	4	2	0
		Females		
Total	30	2	4	1
Normal	18	1	1	0
Disability and Early	12	1	3	1
<65	8	1	1	0
65+	4	0	2	1

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VII. MORTALITY

A follow-up study was conducted of 1,200 men who retired from a U.S. asbestos products company during 1961-1966. These individuals had been employed at several asbestos products plants just prior to retirement. They were observed to December 31, 1967. Detailed work histories were available for virtually all subjects which included estimates of the dust concentration at each job held. Scores were calculated which reflected the total amount of dust exposure a man accumulated up to retirement. Then these it was possible to rank the subjects by the relative severity of their past occupational exposures. The mortality experience of the study group was compared to that of all U.S. white males of corresponding age during the same time period. Emphasis was placed on relating each of several variables from the work history to cause-specific mortality.

The major findings of the study were:

1. Overall, the retirees experienced significantly elevated mortality from lung cancer, cancer of digestive system, and respiratory diseases. The lung cancer risk was two and one-half times that predicted by the experience of U.S. white males. The entire excess in respiratory diseases was due to deaths from pneumoconiosis and pulmonary fibrosis.
2. The excess for lung cancer observed among all retirees

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was unequally shared by the two major occupational subgroups. Men who had worked primarily in production jobs experienced a 7[illegible] per cent excess while a four-fold risk was seen in men who had worked primarily in maintenance-service jobs. The entire excess in deaths from respiratory diseases was confined to men who had worked primarily in production jobs.

3. The pattern of SMR's for lung cancer by category of unadjusted exposure score was somewhat equivocal. After showing a rather large excess of lung cancer deaths in the lowest score category, SMR's decreased and then increased monotonically, reaching a five-fold excess in the highest score category. Among retirees who worked primarily in production jobs SMR's for respiratory diseases increased sharply in the highest category of unadjusted exposure score.

4. When the variable "age at first employment with the asbestos company" was analyzed in conjunction with unadjusted exposure score it was observed that the previous excess in deaths from respiratory diseases among production retirees was maintained only in the "high score - young age" category. On the other hand, the excess in lung cancer deaths among retirees was somewhat independent of age-score category.

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Various factors were discussed which could have contributed to the unusual lung cancer experience seen in the retirees. Among these were differential smoking habits and birthplace. It was shown that the observed differences in lung cancer mortality could not be explained by differences in cigarette smoking patterns alone. Also, it was demonstrated that the large proportion of foreign-born among the retirees could not account for the observed excess in lung cancer deaths.

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APPENDIX A

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A. PERSONNEL RECORD

Name _____ Emp. No. _____ Location _____

(1-9) Soc. Sec. # _____ (10-11) Birth Date _____

(12-13) Birth: State or Country _____

(14) Sex M ___1 F ___2 (15) Race: White ___1 Mex. ___2 Negro ___3
Other ___4 Unknown ___9

(16) Educational Level: 8 yr. or less ___1 9-12 yr. ___2 Over 12 yr. ___3 Unknown ___9

(17) Usual Occ.: Sales ___1 Office ___2 Prod. ___3 Other _____ ___4 Unknown ___9

(18) Prior Dust Exp.: None ___0 Coal ___1 Silica ___2 Coal & Silica ___3
Other _____ ___4 Unknown ___9

(19-20) Last residence (state only): _____

(21) Date of pay/yr. First Job _____ (22) Date of pay/yr. Retirement: _____

Figure 1. Hollrow Survey Form

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B. MEDICAL RECORD

(23) Retirement type: Normal ___0 Disability ___1 Early ___2 Unknown ___9

(24) Employ. Health Status: No pneu. ___0 Pneu. ___1 Unknown ___9

(25-26) Retirement Health Status:

Occupational (25): Normal___0 Asbes.___1 Silic.___2 Mixed Pneu.___3 Other Pneu.___4

Occupational Injury___5 Other_____ ___6 Unknown___9

Non-Occ. (26): Normal___0 Cardiovas.___1 T.B.___2 Emphy.___3 CA-Lung___4

Other CA___5 Arthritis___6 Other _____ ___7 Unknown___9

(27) Smoking Habits: None___0 Cigarette___1 Pipe___2 Cigars___3 Unknown___9

(28) Status 12-31-67: 1. Alive___0

2. Deceased___1 _____date _____certificate*

*If not available, cause of death _____

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JME 27952

Figure 1. Retiree Survey Form (continued)

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C. WORK HISTORY SUMMARY

Location	Dates	Department	Job Title	Amt. of Exp.	Inter. or Steady	Type of Asb.	Other Exp.

JMB 27953

Figure 1. Retiree Survey Form (continued)

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Table 1

Causes of Death of 27 Non-White males
Who Retired Between 1941-1966 and Died
On or before December 31, 1967

Cause of Death and International List Number	Deaths
Respiratory Tuberculosis (001-008)	1
All Cancer (140-205)	4
Cancer of Lung, Bronchus, Trachea, Pleura (162-163)	1
Cancer of Breast (170)	1
Cancer of Prostate (177)	1
Cancer of Bladder and Other Urinary Organs (181)	1
Cerebral Vascular Lesions (330-334)	2
All Heart Disease (400-443)	11
Coronary Heart Disease (420)	7
Other Hypertensive Disease (444-447)	1
Nonsyphilitic Aneurysm of Aorta (451)	2
Influenza with Pneumonia (480)	1
Emphysema without Bronchitis (527.1)	2
Accidents (800-962)	2
Suicide (970-979)	1

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Table 2

Occupational Data and Year of Death of 6 Males
Who Retired Between 1961-1966,
Died on or Before December 31, 1967
For Whom No Death Certificate Was Located

Usual Occupation	Type of Asbestos Products	Unadjusted Exposure Score	Year of Retirement	Year of Death
Maintenance-Service	Unknown	73	1958	1967
Production	Paper	171	1969	1956
Production	Cement	66	1969	1967
Unknown	Unknown	Unknown	1950	1951
Production	Insulations	66	1952	1960
Maintenance-Service	Unknown	38	1961	1966

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Table 3

Available Data and Causes of Death of 18 Males
Who Retired During 1941-1966,
Died on or Before December 31, 1967
For Whom No Work History Was Available

Year of Retirement	Year of Death	Cause of Death and International List Number
1943	1946	Respiratory Tuberculosis (001)
[illegible]	1947	Cancer of Stomach (151)
1946	1955	Cancer of Prostate (177)
1946	1958	Cancer of Prostate (177)
1949	1958	Cerebral Hemorrhage (331)
1942	1945	Cerebral Hemorrhage (331)
1945	1947	Cerebral Thrombosis (332)
1953	1956	Coronary Heart Disease (420)
1948	1954	Coronary Heart Disease (420)
1941	1946	Coronary Heart Disease (420)
1950	1965	Coronary Heart Disease (420)
1942	1946	Other Myocardial Degeneration (422)
1946	1948	Unspecified Disease of Heart (434)
1943	1945	Hypertensive Heart Disease (442)
1941	1950	Hypertensive Heart Disease (443)
1946	1949	Hyperplasia of Prostate (610)
1941	1949	Hyperplasia of Prostate (610)
1952	1952	Fracture of Skull (803)

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Table 4

Occupational Data of 22 Males Who Worked Primarily in Maintenance-Service Jobs, Retired During 1941-1966 and Died from Lung Cancer On or Before December 31, 1967

Job(s)	Total Unadjusted Exposure Score	Age at First Employment with the Asbestos Company
Oiler, Millwright	576	29
Electrician	267	31
Millwright	133	44
Machinist	3	45
Millwright	64	49
Machinist	22	43
Electrician	275	30
Machine Operator (Packings Department), Yard Clean-up Man	112	40
Truck Driver	30	34
Painter	169	42
Unloader (Insulations), Laborer (Cement), Carpenter	347	23
Fireman (Power House)	0	24
Electrician, Mechanic	114	45
Pipe Fitter	248	28
Machinist, Mechanic	68	34
Tinsmith	221	33
Foreman (Machine Shop)	22	43
Millwright	178	31
Construction Laborer	63	47
Laborer (Cement), Electrician	288	30
Machinist, Mechanic	109	47
Rigger, Painter	152	45

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APPENDIX B

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Table 1

Distribution of Total Deaths and Person-Years Through December 31, 1967 by Age and Calendar Period for 1,294 Males Who Worked in 11 Asbestos Products Plants And Retired During 1961-1966

Calendar Period		Age					
	All Ages	65 - 69	70 - 74	75 - 79	80 - 84	85 & over
1961 - 67						
Deaths	658	219	218	135	64	22
Person-Years	9866.94	4964.69	3022.66	1303.08	460.87	115.83
1961 - 67						
Deaths	26	12	9	4	1	0
Person-Years	603.29	359.37	165.21	70.92	7.79	0.00
1962 - 62						
Deaths	69	30	19	12	7	1
Person-Years	1305.21	794.66	363.37	103.25	42.67	1.66
1963 - 67						
Deaths	119	47	42	22	5	3
Person-Years	2027.12	1054.61	652.00	241.12	61.42	18.17
1964 - 62						
Deaths	203	65	57	53	19	9
Person-Years	2757.28	1364.08	813.96	414.21	130.33	34.62
1965 - 67						
Deaths	241	65	91	44	32	9
Person-Years	3174.12	1392.16	1028.12	473.58	218.67	61.58

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Table 2

Distribution of Total Deaths and Person-Years Through December 31, 1967 by Age and Year of Retirement for 1,296 Males Who Worked in 11 Asbestos Products Plants And Retired During 1941-1966

Year of Retirement		Age					
	All Ages	65 - 69	70 - 74	75 - 79	80 - 84	85 & over
1941 - 66						
Deaths	658	219	218	135	64	22
Person-Years	9266.94	4964.49	3022.66	1303.08	460.87	115.83
1941 - 57						
Deaths	196	23	47	58	46	22
Person-Years	2570.79	706.00	886.75	603.12	339.08	115.83
1948 - 52						
Deaths	161	45	49	49	18	0
Person-Years	2061.87	868.71	680.62	390.83	121.71	0.00
1953 - 57						
Deaths	167	53	86	28	0	0
Person-Years	2358.12	1282.50	969.62	305.92	0.08	0.00
1958 - 62						
Deaths	92	56	36	0	0	0
Person-Years	1855.50	1287.62	564.67	3.21	0.00	0.00
1963 - 66						
Deaths	42	42	0	0	0	0
Person-Years	820.66	817.66	1.00	0.00	0.00	0.00

JME 27960

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Table 3

Distribution of 664 Deaths by Detailed Causes Occurring Between July 1, 1961 and December 31, 1967 Among 1300 Males Who Worked in 11 Asbestos Products Plants and Retired During 1941-1966

Cause of Death and International List Number	Deaths
All Causes	664
Respiratory Tuberculosis (001-008)	15
All Cancer (140-205)	143
Cancer of Buccal Cavity and Pharynx (140-148)	4
Cancer of Esophagus (150)	4
Cancer of Stomach (151)	23
Cancer of Intestines (152-153)	7
Cancer of Rectum (154)	7
Cancer of Liver (155-156)	3
Cancer of Pancreas (157)	6
Cancer of Peritoneum (158)	1
Cancer of Unspecified Digestive Organs (159)	2
Cancer of Larynx (161)	2
Cancer of Lung, Bronchus, Trachea & Pleura (162-163)	46
Cancer of Breast (170)	1
Cancer of Prostate (177)	11
Cancer of Kidney (180)	3
Cancer of Bladder & Other Urinary Organs (181)	2
Cancer of Eye (192)	2
Cancer of Brain (193)	1

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JMC 27961

Table 3

(continued)

Distribution of 664 Deaths by Detailed Causes Occurring Between July 1, 1941 and December 31, 1967 Among 1300 Males Who Worked in 11 Asbestos Products Plants and Retired During 1941-1966

Cause of Death and International List Number	Deaths
Cancer of Other Endocrine Glands (195)	1
Cancer of Other and Unspecified Sites (199)	9
Malignant Lymphoma (200, 201, 203)	4
Leukemia (204)	4
Benign Neoplasms & Neoplasms of Unspecified Nature (210-239)	1
Diabetes Mellitus (260)	10
Vascular Lesions Affecting Central Nervous System (330-334)	60
Diseases of the Circulatory System (400-468)	323
Chronic Rheumatic Heart Disease (410-416)	5
Arteriosclerotic (Coronary) Heart Disease (420)	225
Nonrheumatic Endocarditis & Other Myocardial Degeneration (421-422)	30
Other Diseases of Heart (430-434)	11
Hypertensive Heart Disease (440-443)	22
Other Hypertensive Disease (444-447)	6
General Arteriosclerosis (450)	13
Nonsyphilitic Aneurysm of Aorta (451)	6
Other Circulatory Disease (400-402, 452-468)	5
Diseases of the Respiratory System (470-527)	32
Influenza & Pneumonia (480-498)	13

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Table 3

(continued)

Distribution of 664 Deaths by Detailed Causes Occurring Between July 1, 1961 and December 31, 1967 Among 1300 Males Who Worked in 11 Asbestos Products Plants and Retired During 1941-1966

Cause of Death and International List Number	Deaths
Bronchitis (500-502)	2
Silicosis (523.0)	1
Anthracosilicosis (523.1)	1
Asbestosis (523.2)	15
Pneumoconiosis (NOS) (523.3)	4
Other Chronic Interstitial Pneumonia (525)	6
Emphysema Without Bronchitis (527.1)	7
Other Respiratory Diseases (470-478, 510-522, 524, 526, 527.0, 527.2)	3
Ulcer of Stomach & Duodenum (540-541)	2
Cirrhosis of Liver (581)	11
Chronic Nephritis & Other Renal Sclerosis (592-594)	1
Accidents (800-962)	15
Suicide (970-979)	5
Unknown Cause	6
All Other Causes	20

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FEB 26 1971

FILE

TULANE UNIV.
EDUC. STUDY
MARRERO

General Headquarters
February 25, 1971

T. H. Davison, M.D.
C. L. Sheckler
G. L. Swallow
G. W. Wright, M.D.

TULANE STUDY

Arrangements have been completed for a meeting with Dr. Hans Weill and his staff at the Marrero plant on Friday, March 26, to discuss the approach to estimating occupational exposures.

John Parks has made reservations at the Howard Johnson Motel, 330 Loyola Avenue, New Orleans, for the night of March 25 and will provide transportation to the plant on Friday, March 26.

H. M. Jackson

cc: John Parks
Hans Weill, M.D., Tulane University

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General Headquarters
March 17, 1971

G. W. Wright, M.D. - Cleveland
T. H. Davison, M.D. - Waukegan

RETIREE STUDY

Attached are copies of letter and charts recently received from Dr. Enterline. The charts reflect some further organization of the statistics developed in Pierre Decoufle's doctoral thesis, which was forwarded to you a few weeks ago. His observations are of considerable interest.

Dr. Enterline is currently working on the extension of the study to include Asbestos Plant, Jeffrey Mine and the "non-exposure" plants and offices.

Over the phone last week, he commented:

(1) That in the "non-exposure" plants, maintenance and service personnel had a higher incidence of bronchogenic cancer whereas the production groups had general population equivalent rates.

(2) That at Asbestos Plant, there was a higher incidence of bronchogenic cancer comparable to that of the U. S. exposed plants; and in the mine and mill population, there was a higher incidence primarily in the A & D Railway group.

He anticipates completion of the total report within the next couple of months.

Further attempts to evaluate the significance of these observations can only appropriately be made upon review of the complete study.

H. [illegible] Jackson

Attachments

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TULANE UNIVERSITY
School of Medicine
NEW ORLEANS, LA. 70112

Department of Medicine
Pulmonary Diseases Section
1430 Tulane Avenue

April 12, 1971

TO: New York Office, Johns-Manville Company
Mr. Hugh Jackson
Mr. G. L. Swallow
Dr. T. H. Davison
Mr. C. L. Sheckler

Cleveland
Dr. George Wright

Marrero - Johns-Manville
Mr. John Parks
Mr. Ed. Riley
Mr. Henry Naquin

FROM: Hans Weill, M. D.
Tulane University School of Medicine

I would again like to express our sincere appreciation for your very helpful participation in our recent meeting regarding grading of exposures in the Marrero Plant. Miss Waggenspack and I have modified the original charts according (we hope) to what was decided by the group. We will appreciate your review of these charts so that you might bring to our attention any discrepancies with your understanding of what was decided upon. Carmel has also separately presented comments and questions concerning this matter on which we welcome your response.

We now feel much more comfortable about our exposure grading as a result of your efforts and we are grateful for your review of these revised estimates.

Sincerely yours,

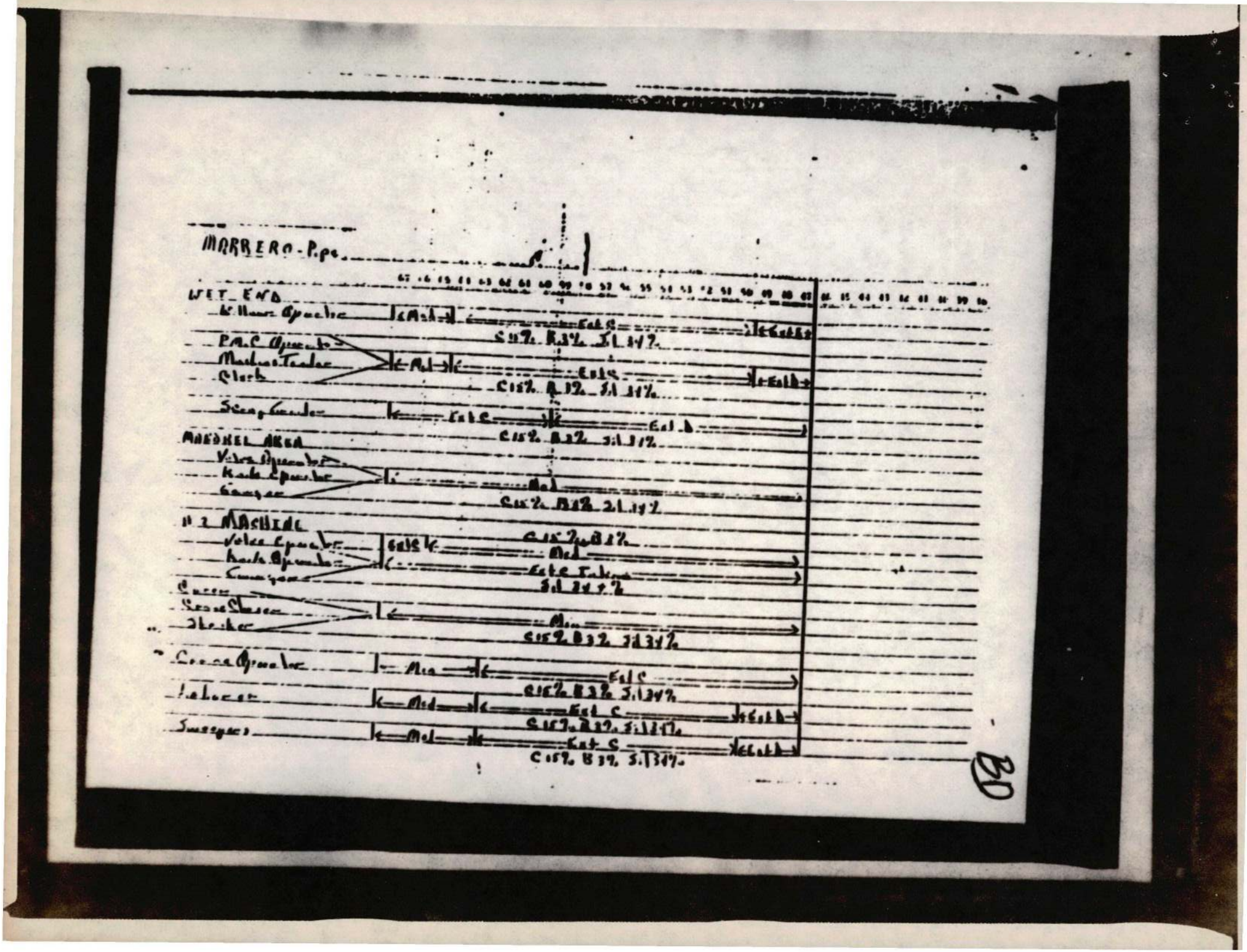
Hans Weill

Hans Weill, M. D.

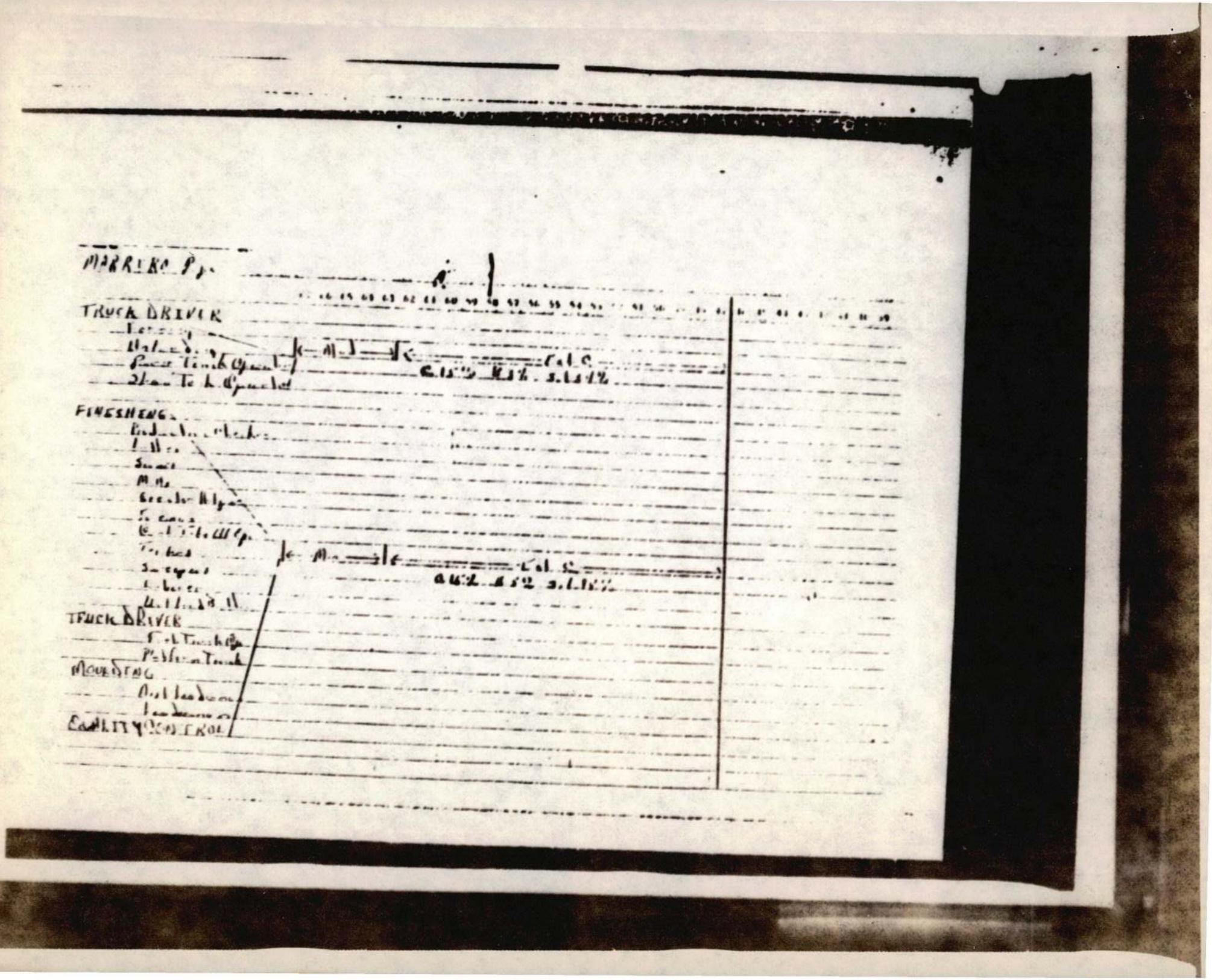
HW/j
enclosures

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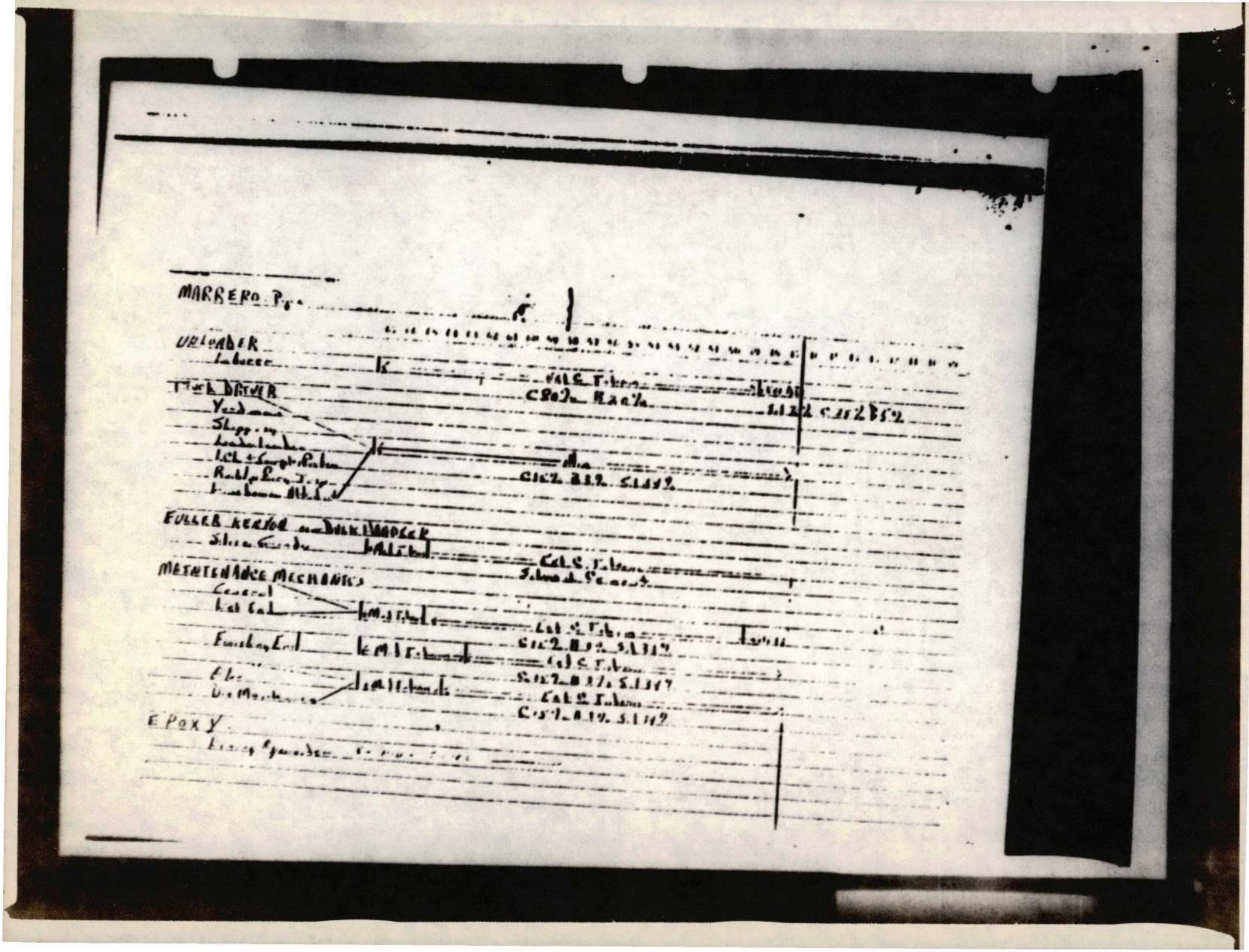
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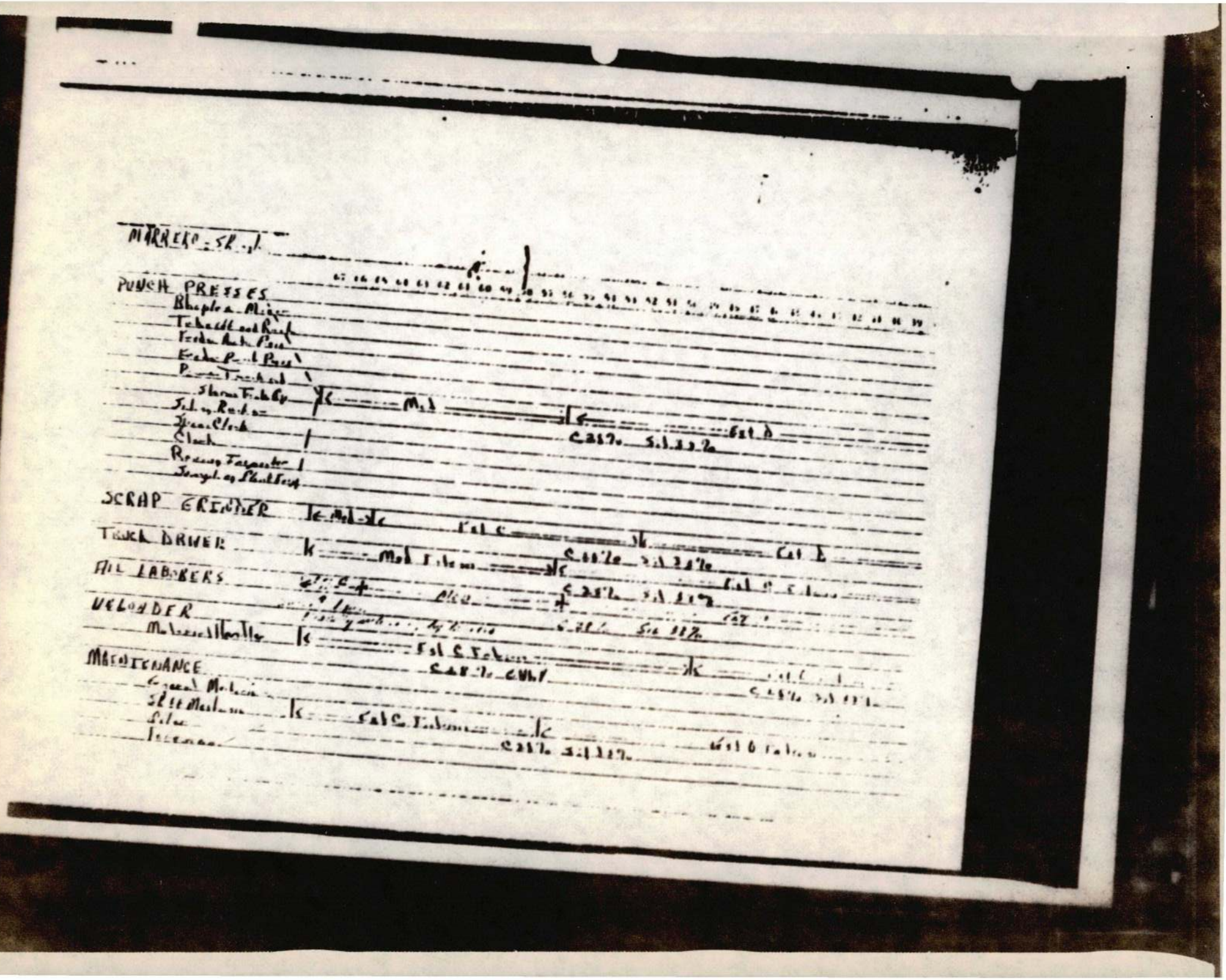
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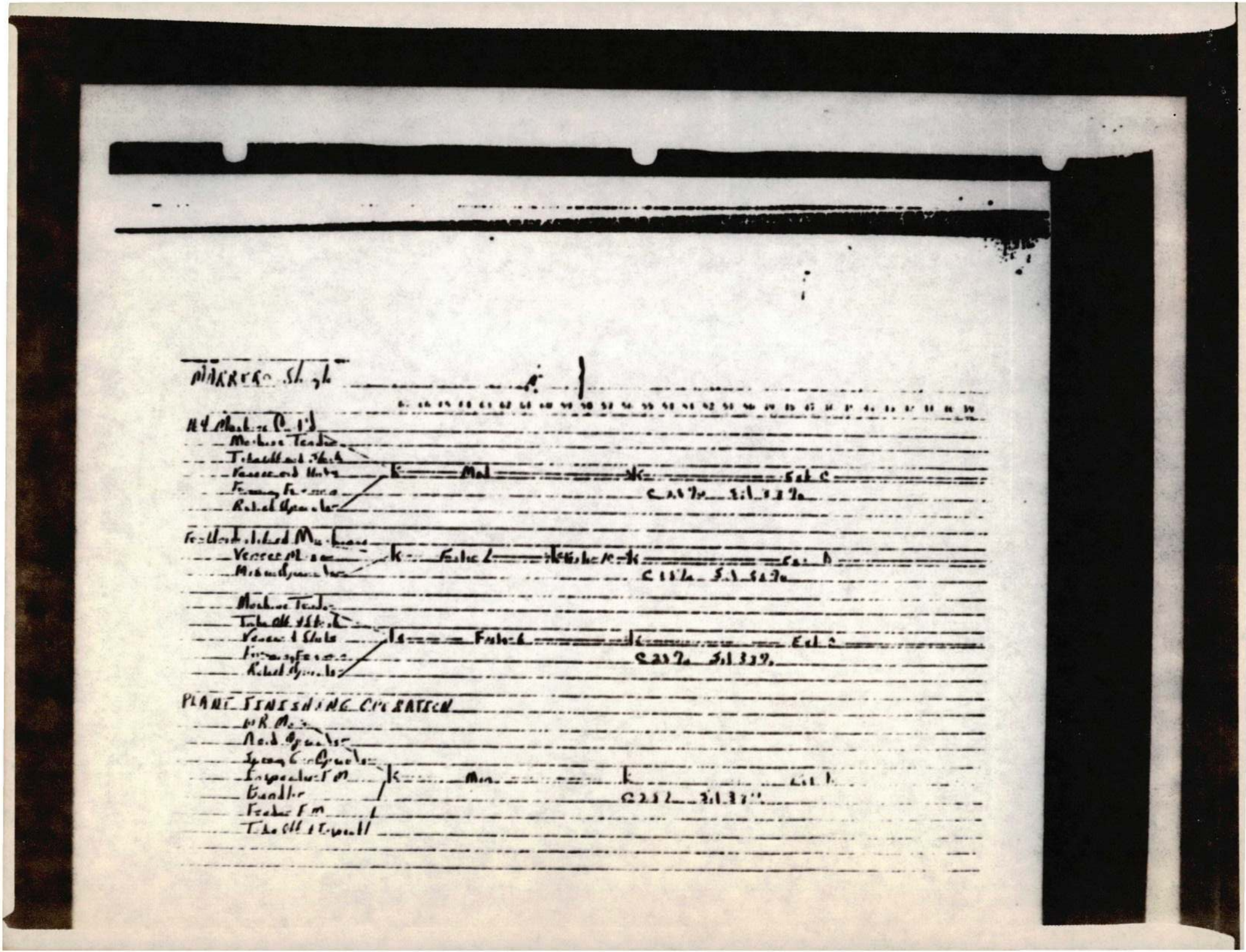
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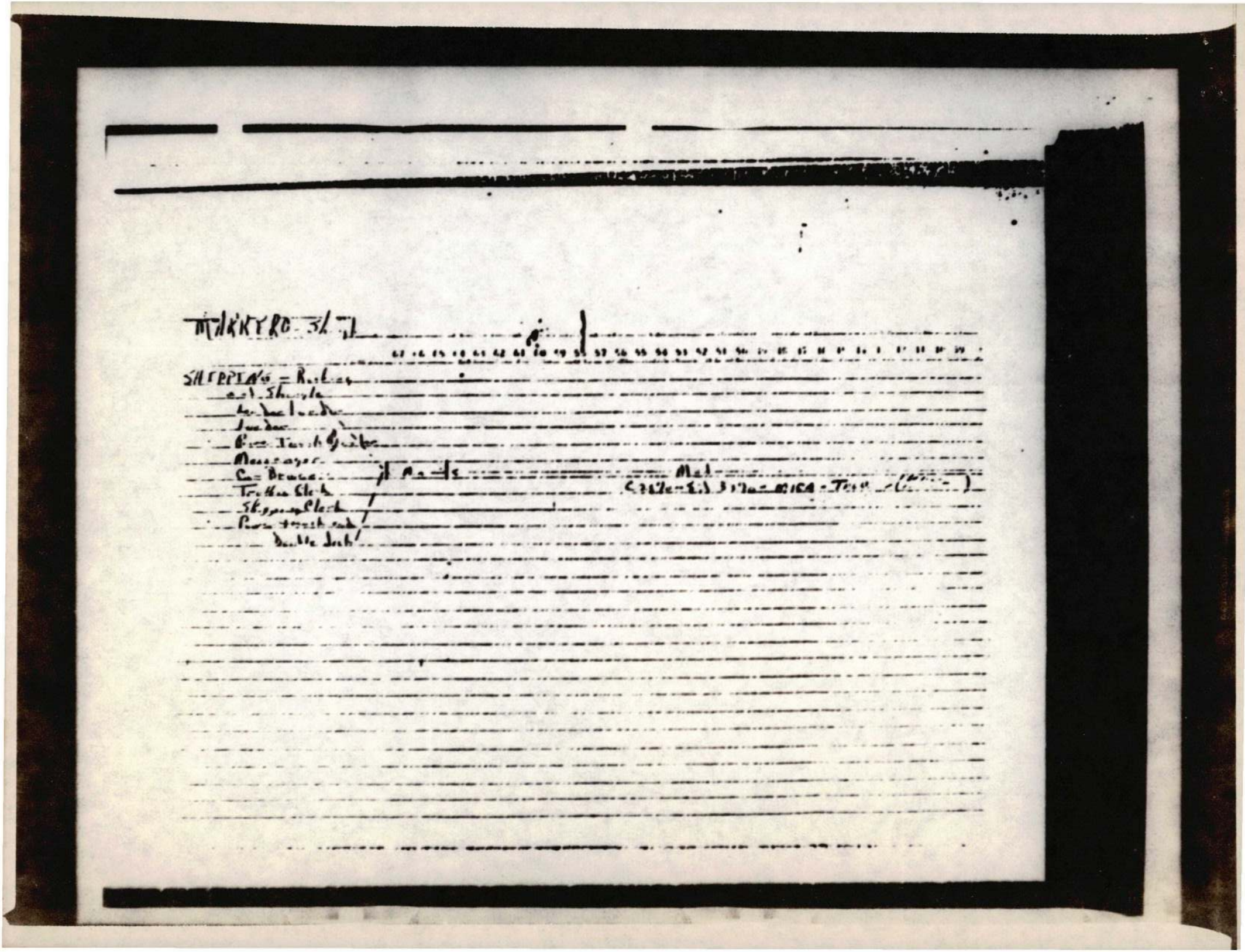
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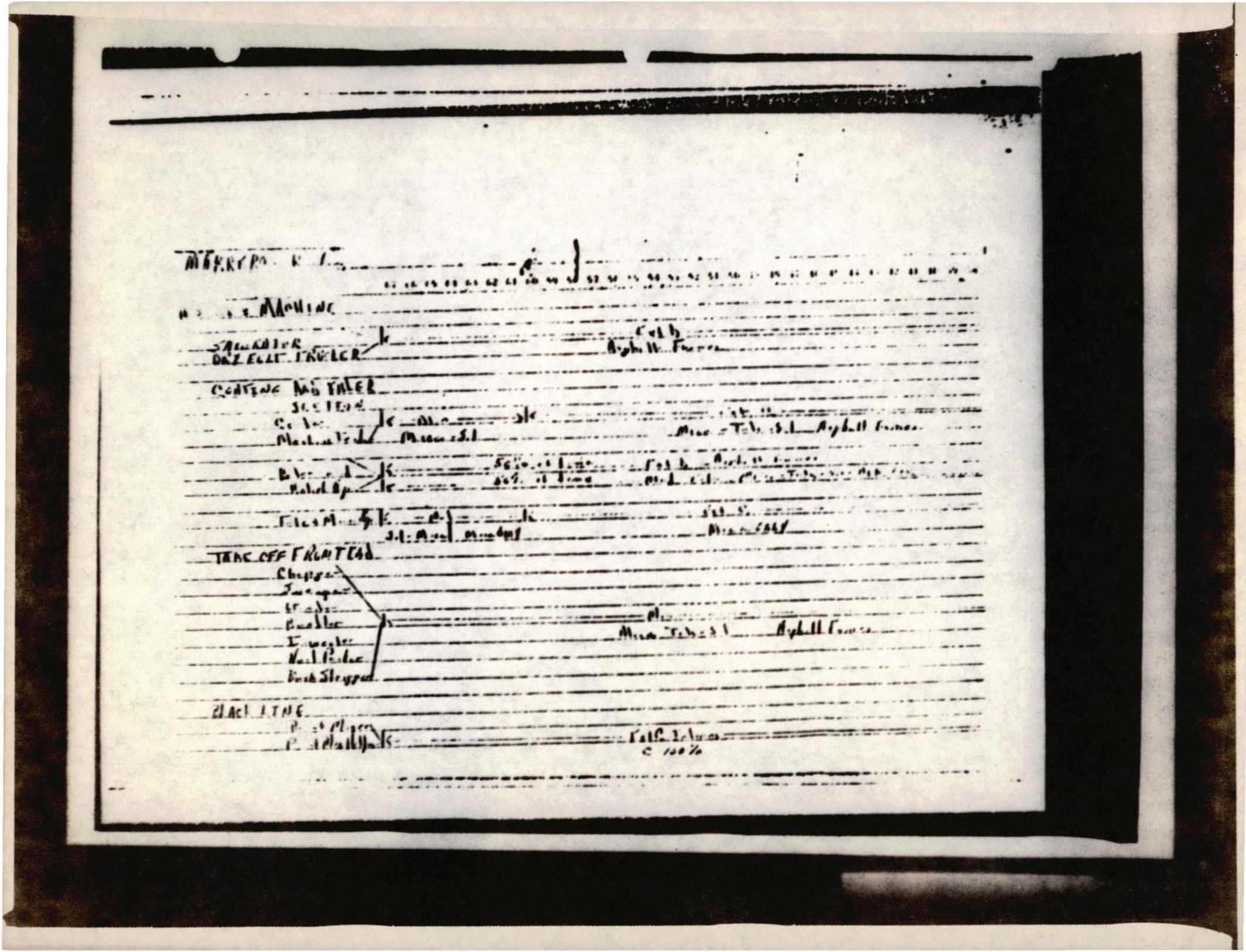
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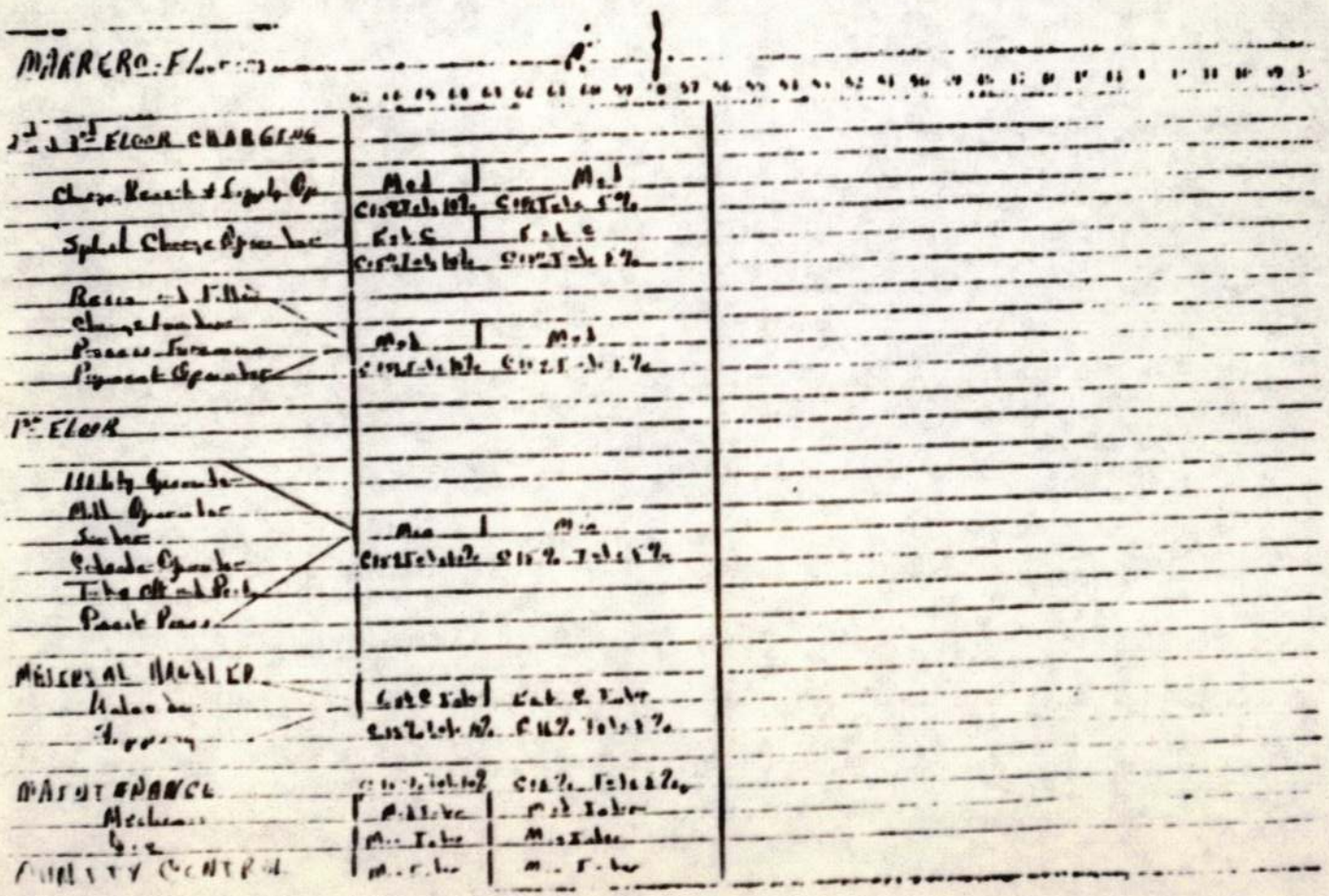
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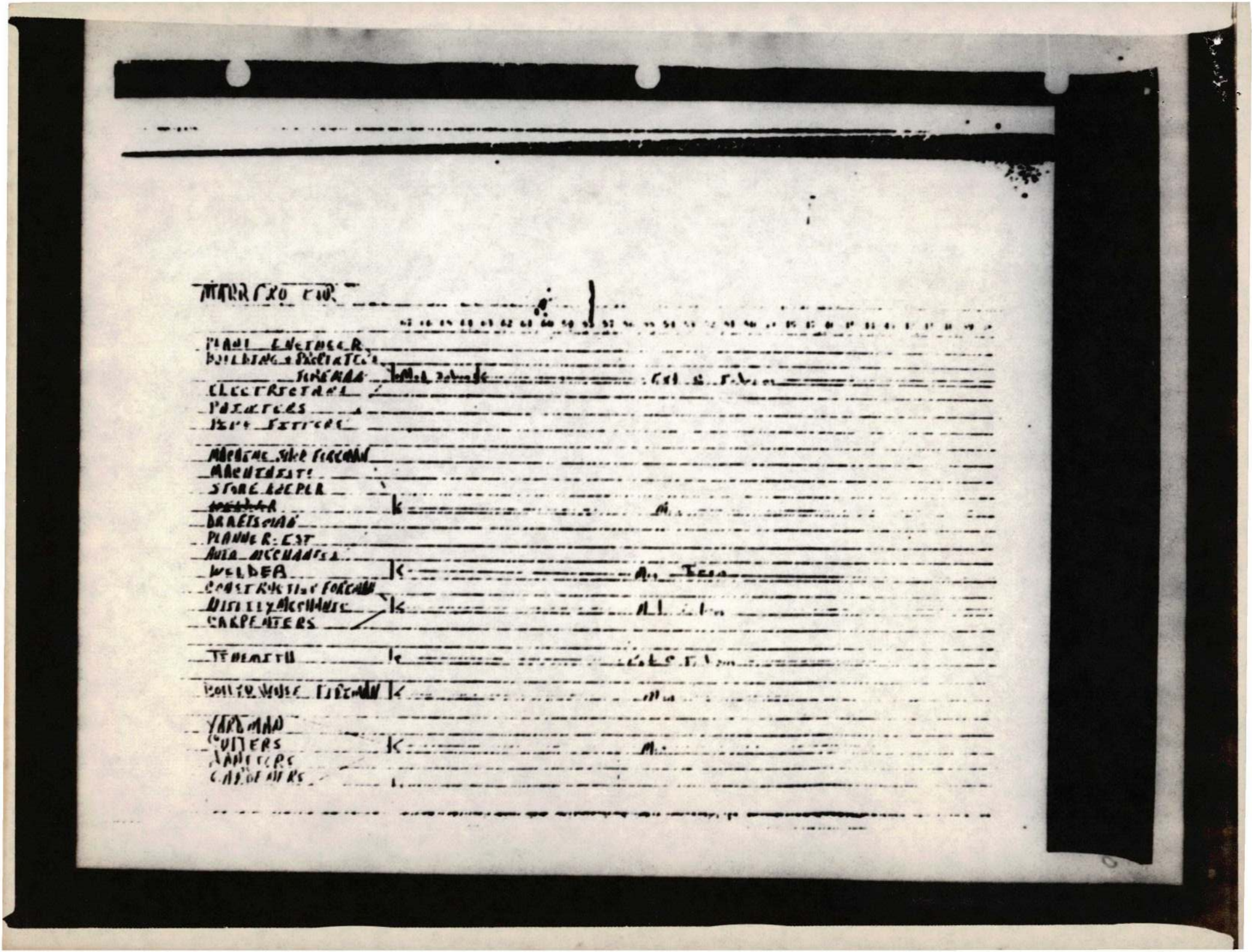


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Manheim
April 14, 1971

R. Milder, General Headquarters
cc: R. M. King

Since 1962, Manheim has been informing employees of their physical condition relative to dust. Management has been moving these employees to dust-free jobs and on a periodic basis, we audit all of our "red cases" to make sure they are on dust free jobs.

The Union has known that we have been informing employees that they are dusted when we receive confirmation by X-rays, etc. and that the Company Doctor has been handling this program. They were not aware that, in some cases, we were moving employees to dust free jobs. In the past, there has always been open jobs and the situation has been handled by the supervision with the employee following the employee's discussion with the Plant Physician. Recently, two employees have brought to the attention of the Union officials that they were being moved from one job to another because of a "dust problem." The Union now wishes to sit down and discuss this whole problem with Management as to what our intention is and how we plan to handle these cases in the future.

I told Ben Foust yesterday that we have had this program in existence for a number of years at Manheim and that, in my opinion, Management has done an excellent job of moving these people to dust free jobs in a way that has not hurt the employee either physically or financially and with a minimum of problems on anyone's part.

Ben Foust told me that the Union was going to discuss this at the next Executive Board Meeting and he thought a proposal would be made that any employee who has a pulmonary problem which was caused by asbestos, silica, etc. and could be related to his past work, should be given a red circle rate for the duration of his employment. Ben's example was an employee makes $4.00 an hour on his present job and is forced to move because of a pulmonary problem to a job paying $3.75, he would retain his $4.00 rate until retirement or until he went to a higher paying job.

I don't feel that we have an immediate problem at Manheim in this area. We might see a flurry of activity, but I don't think it will continue for a prolonged period of time. However, I think Ben's new found interest in this area and his activity with the J-M Council, I would not be a bit surprised to see increased pressure in this area in the future.

C. L. Rice

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CONFIDENTIAL

Waukegan
April 27, 1971

R. J. Riley - Marrero Plant
J. A. Parks - Marrero Plant

PNEUMOCONIOSIS CASES

You have of course received the copy of my letter to Dr. Hans Weil and although I have not had any reply from him as yet, I would like to get the mechanism formulated to proceed with counseling these cases as expeditiously as possible. Can you advise me of Dr. Gidman's present status, so that I may make some preliminary contact with him about our desires in this matter and probably arrange a personal visit with him.

T. H. DAVISON, M.D.

cc
H. M. Jackson - GHQ New York PO 91

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RECEIVED MAY 13 1971

St. Louis
May 11, 1971

C.B. Martin, Kansas City
E.M. Schweickhardt, St. Louis
H.H. Rambree, Tulsa
C.M. Jurrjens, Houston

W.E. Picard, Dallas
J.T. Ranne, San Antonio
cc: File
T.P. Williams, DHQ

DUST CONTROL
WAREHOUSES AND JOBSITES

We recently discussed the problems of dust control in our warehouses and jobsites. I feel that our housekeeping at warehouses has been very good and that everyone has been made aware of the situation and have been cooperating fully.

We also discussed the controls at jobsites and I advised that we should have a report from Headquarters shortly on type of equipment recommended and that we would have to get into jobsite dust control more strongly than we have to date. This is primarily true if we are going to set up jobsite fabrication shops.

We discussed the two manuals put out by Mims which are entitled "Recommended Health Safety Practices." There was a white brochure covering products containing Asbestos and a yellow brochure covering products containing mineral fibers. The brochure goes into ideas and suggestions for handling and applying Thermo insulation products.

We discussed a recent problem which came up over the fact that someone said they had never seen these brochures. Upon review it was noted that no one in the company has ever sent out this brochure but that some of you had seen it since you had been to a Contractors Association meeting and they were passed out at this time. Out of the fourteen people at the meeting four people had seen the brochures.

I am enclosing copies of these two brochures which I want you to review and discuss with each person under your supervision which includes all warehouse personnel. I feel that after you have done this it would be advisable to pass these on to the construction superintendents so that he can review and carry on with our jobsite personnel.

We are all aware of the problems caused by Asbestos and the many cases which are in process around the Country as well as those which have been finalized. We have a responsibility to our employees and we want to take positive action on dust control both at our facilities and at jobsites

where it is our problem and our cause.

As I make a trip through the region I will want to discuss the handling methods with you and see that we are in the process of relieving our dust problems and that good housekeeping practices are in effect at all locations.

I will forward information on dust collection systems as soon as I receive it at this office.

If you have any questions in the meantime concerning any problems involving handling or dust control please do not hesitate to contact me as we want to get a action program in effect as soon as possible where we are not presently enforcing it.

J. [illegible] Grimmer

JAC/cy

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CHQ
May 12, 1971

Pottsville cancer?
1. Deaths - at the point the [illegible]
2. [illegible]

J. D. Anderson - Manville
L. H. Hemerda - Manville

OCCUPATIONAL DISEASE
STANDARD PRACTICES IH-600 SERIES

Please prepare information in accord with Standard Practices IH-600 series for all cases with a possible involvement of any type of cancer, including mesothelioma.

IH-600 material should include all information except the x-ray films. If x-ray films are required, they will be requested. The cover letter should be addressed to me and specifically cover all of the events and details available.

IH-600 material should be forwarded promptly upon learning of a potential or actual case. This knowledge may come by way of the medical department from outside sources, disability retirement requests, discussion with union representatives or employees, through the supervisory group, etc. Regardless of the source, it should be immediately checked and an IH-600 prepared.

Subsequent to my review of the information, we will discuss Workmen's Compensation case handling procedures. Arrangements for medical examination and legal representation should be withheld pending our discussion and recommendations.

C. L. Sheckler

cc: A. B. Marchant
H. M. Jackson
T. H. Davison, M.D. - Waukegan
W. L. Raff - Manville
R. M. Liss, M.D. - Manville

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POLICY COMMITTEE MEETING

J-M ENVIRONMENTAL HEALTH TASK FORCE

MAY 21, 1971

- -

F. L. PUNDSACK

1. F. L. Pundsack reported on the meeting held May 12 in Washington, D. C. with Dr. John Middleton and other members of the Air Pollution Control Office of the Federal Environmental Protection Agency (a written report by W. P. Raines on the meeting was distributed to Policy Committee members on May 13). Those attending the meeting on behalf of the AIA/NA were Pundsack, Raines, E. M. Fenner, Dr. Eugene Stefl of Raybestos-Manhattan, and Dr. George W. Wright.

The most important result of the meeting was that contacts were established with those individuals in the EPA who will be responsible for developing the Federal asbestos air pollution control standards and regulations.

E. M. Fenner is expected to be named to serve on an EPA committee to review the proposed standards. Members of this review committee will receive a draft of the EPA document on or about July 15. A meeting will be held sometime in August to discuss committee member comments, and the revised document will be published in the Federal Register on September 27. According to law, a public hearing on the regulations must be held within 30 days of publication in the Federal Register, placing Federal hearings sometime in October.

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40.1

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Pundsack has sent Dr. John Finklea of the EPA (who attended the meeting) material on brake lining tests conducted by J-M, and plans to deliver our asbestos-cement water pipe data in person.

2. Because of the great importance of the October Federal EPA hearings, Pundsack recommended that J-M begin planning for them now. Whether J-M decides to support the regulations or not will, of course, depend on the final document; however, in either case, we will want to have as many qualified medical and technical people testify as possible in support of our position. Pundsack suggested that the Scientific Relations Sub-Committee meet to put together a list of possible witnesses. Each member of the Policy Committee was asked to submit a list of witnesses for consideration by the Scientific Relations Sub-Committee. It was recommended that J-M take into consideration in its selection of witnesses the type of presentation that Dr. Selikoff is likely to make at the hearing, and who would be best qualified to rebut him.

K. V. Lindell commented that we should not hesitate to talk about talc as a source of asbestos in the ambient air.

Dr. Wright said that he will get together with Ed Fenner to discuss what additional data (dust counts etc.) we should have for presentation at the hearings.

40.2

-more-

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Among the names suggested as possible witnesses were Corbett MacDonald, Lewis Cralley, the Canadian Minister of Trade, Marcus Key, Paul Kotin, someone from the British Government, Marvin Kushner and Bill Smith.

Each of these individuals, and any others selected by the Scientific Relations Sub-Committee, would have to be contacted personally as to their willingness to appear and the type of testimony they would give.

The proposed EPA emission standards will be distributed to members of the Policy Committee as soon as they are received (presumably in mid-July).

3. Pundsack reported briefly on the recent spray hearing in Albany. A status report on the spray situation across the country was distributed to the Policy Committee prior to the meeting. Raines reported that on May 20 the Chicago City Council Committee on Environmental Health had voted to ban sprayed asbestos in that city.

4. Pundsack reported on an article by Bill Nicholson scheduled to appear in the next issue of the IIHRP Progress Reports. In the article Nicholson misused dust count data collected by Bill Roitze, and arrived at the unsound conclusion that a 5 fiber TLV was far too high for safe occupational exposure

40.3

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and that a level of 3 fibers was responsible for all the disease found by Dr. Selikoff among the insulation workers. Pundsack talked to Nicholson and Dr. Selikoff about the article and they agreed to make some minor changes in the text; however the basic idea of the article remained intact.

Pundsack commented that, in his opinion, J-M cannot afford to let its name be associated with this type of irresponsible action on the part of Dr. Selikoff and the IIHRP, and that the J-M members on the IIHRP Board and Dr. Wright should consider submitting their resignations. J. B. Jobe agreed.

Pundsack also recommended that the inorganic micro-particles study being funded at Mount Sinai by J-M should not be continued beyond its present expiration date of October 31.

F. J. Solon to draft letters of resignation for Jobe, Pundsack and Dr. Wright. It was agreed that the letters should be short and concise, and that no reasons be given for the resignations.

A. B. MARCHANT

1. A. B. Marchant commented that a long interview with Dr. Selikoff on the joint union-management environmental control committee at Manville will appear shortly in the MANVILLE NEWS. According to Marchant, it appears that the union, now that the strike is over, is no longer as enthusiastic about the joint committee as it was earlier.

40.4

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J. B. JOBE

1. J. B. Jobe read a letter he had received from Dr. Selikoff asking for our cooperation in doing an epidemiological study at Manville as part of the joint program. It would appear that Dr. Selikoff would like the health records of our employees.

It was agreed that permission to look at these records should not be given to Dr. Selikoff. A. B. Marchant to draft a reply to Dr. Selikoff stating our position that the union-management agreement was for control and engineering purposes only, and not for health research, and that HEW is covering this area in its study of the industry.

Dr. Davison commented that under the new Health and Safety Act, Dr. Selikoff (through the union) will be able to get his hands on the Manville health records without our permission. Whether or not this would include access to x-rays is questionable.

A. C. SMITH

1. A. C. Smith brought up the question of whether J-M should continue to try to eliminate crocidolite in its products where possible. Dr. Wright commented on what is known about the health effects of crocidolite as compared to the other varieties, and recommended that J-M try to replace crocidolite wherever possible. He feels that the EPA may impose stricter regulations on crocidolite than on other varieties as a gesture to the various environmental groups.

40.5

-more-

W. L. VAN-DERBEEK

1. W. L. VanDerbeek suggested that J-M hold a seminar for people in middle and lower management to acquaint them with the facts about asbestos-health. The senior officers and division managers have, for the most part, been kept informed of developments in this area, but there has been a lack of communication at the lower management levels.

   Various methods of holding such a seminar or series of seminars were discussed. F. J. Solon will coordinate.

2. Dr. William Smith of Fairleigh-Dickinson is presently engaged in research of considerable importance to the asbestos-industry, but he is running out of funds to continue his work. He has applied to the IOEH for a grant and has also written to Sid Speil.

   Dr. Wright said that he feels it imperative that Dr. Smith's work be continued; it promises to provide useful information on the relationship between EM sized fibers and mesothelioma.

   It was agreed that J-M should provide Dr. Smith with some funds to help keep his work going at least until the various grants he has applied for come through.

   F. L. Pundsack and Dr. Wright will see Dr. Smith to investi his needs. The J-M Fund will then be asked to make a gra Fairleigh-Dickinson to support Dr. Smith's work.

40.6

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W. P. RAINES

1. W. P. Raines commented briefly on recent developments in the "asbestos in women's coats" controversy. The Federal Trade Commission and the Federal Food and Drug Administration have both contacted J-M about this situation. The FTC is considering an embargo on further importation of the coat material, and the Food and Drug Administration is considering a re-call of those coats already sold, both for health reasons.

2. Raines also reported on preliminary contacts made with the editor of OCCUPATIONAL SAFETY & HEALTH REPORTER concerning an article which appeared in their first issue stating that the purpose of the IIHRP was to control fibrous emissions from air conditioning ducts. It was agreed that the publication should be given the factual story of the IIHRP.

F. . SOLON, JR.

40.7

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MOUNT SINAI SCHOOL OF MEDICINE
of The City University of New York
FIFTH AVENUE AND 100TH STREET • NEW YORK, N.Y. 10029

Department of Community Medicine

June 28, 1971

Mr. J. B. Jobe
Johns-Manville Industries
22 East 40th Street
New York, New York 10016

Dear Burt:

I very much appreciated the opportunity of reviewing with you, Mr. Jackson, Mr. Marchant, Dr. Fundsack, Mr. Sabourin, Mr. Solen and Dr. Wright, our proposed research concerning an effective surveillance program, designed to review and document the suitability of the environmental control measures that have been and are being introduced in Manville.

When Local 800 of the Papermakers and Paperworkers Union asked Dr. E. Cuyler Hammond and me to advise them regarding how the effectiveness, in terms of human health, of the new control measures might be monitored, we were impressed with the logic of this approach, especially in view of their new joint responsibilities, with J-M, in your Environmental Committee. I was confident that I would find, and I did, that you and your colleagues were similarly committed to the solution of such health problems as might exist.

Dr. Hammond and I have reviewed with Local 800 data, records, etc., available to them which would be useful in the conduct of this research and we are now considering the most appropriate design for the study. We find that our work would be facilitated and its usefulness enhanced if some additional data, limited to the purposes of this investigation, could be made available.

1. It will be necessary to exactly characterize the group of J-M employees represented by the Union that we will be studying prospectively, from a point of time in the past. While the Union has much information concerning these people (age, sex, employment status, departmental category, etc.) it would be useful to be able to confirm some of these data from an independent source. For example, it would be advantageous to be sure about the exact date of an employment and, if possible, to know whether there had been prior J-M employment.

(Interrogatory #30, parts (a), (b) & (c).)

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Mr. J. B. Jobe June 28, 1971

2. Since analysis of the tempo, extent and degree of radiographic change might prove a useful guide to evaluating the effectiveness of control measures, the opportunity of reviewing prior x-rays of the individuals included in this investigation, might be most informative.

3. We are particularly interested in the experiences of groups of individuals who have had little or no adverse health effects; evaluation of their exposure and work conditions might provide much helpful data for analysis. Identification of such groups would be useful.

It is our hope that J-M will find it possible to assist in this research, providing access to the data outlined above. We believe this request is made with the expectation that the planned research will be of considerable benefit both to Local 800 and to J-M, since all must look to the elimination of unnecessary health hazards in this important industry. We understand that this will not happen overnight and that, however effective new control measures are in preventing future disease, our legacy of the past, in which inadequate appreciation of the problem was reflected by inadequate control measures, will plague us for some years. What better activity in these years than all necessary effort to ensure solution of the problem.

It is not our intention that your cooperation hurt you. We understand that the data provided would be for research purposes only. Insofar as any individual is concerned, it would remain entirely confidential. In particular, where problems of workmen's compensation may be considered by others, we would not participate in such consideration, and the data being examined by us would, as noted, remain confidential.

We hope that J-M will find it possible to cooperate with us in this work. We would consider this an extention of its stated and recognized policy of the rapid development and introduction of the control measures needed to eliminate health hazards that might exist.

Sincerely yours,

Irving J. Selikoff, M.D.
Professor

IJS:sa

cc: E. Cuyler Hammond
Joseph Mondrono
Robert Klinger
[illegible]

MOUNT SINAI SCHOOL OF MEDICINE
of The City University of New York
FIFTH AVENUE AND 100TH STREET • NEW YORK, N.Y. 10029

Department of Community Medicine

June 28, 1971

Mr. J. B. Jobe
Johns-Manville Industries
22 East 40th Street
New York, New York 10016

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(Re Interrogatory #30, parts H, (b) i(c1),)

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Mr. J. B. Jobe June 28, 1971

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3. We are particularly interested in the experiences of groups of individuals who have had little or no adverse health effects; evaluation of their exposure and work conditions might provide much helpful data for analysis. Identification of such groups would be useful.

It is our hope that J-M will find it possible to assist in this research, providing access to the data outlined above. We believe this request is made with the expectation that the planned research will be of considerable benefit both to Local 800 and to J-M, since all must look to the elimination of unnecessary health hazards in this important industry. We understand that this will not happen overnight and that, however effective new control measures are in preventing future disease, our legacy of the past, in which inadequate appreciation of the problem was reflected by inadequate control measures, will plague us for some years. What better activity in these years than all necessary effort to ensure solution of the problem.

It is not our intention that your cooperation hurt you. We understand that the data provided would be for research purposes only. Insofar as any individual is concerned, it would remain entirely confidential. In particular, where problems of workmen's compensation may be considered by others, we would not participate in such consideration, and the data being examined by us would, as noted, remain confidential.

We hope that J-M will find it possible to cooperate with us in this work. We would consider this an extention of its stated and recognized policy of the rapid development and introduction of the control measures needed to eliminate health hazards that might exist.

Sincerely yours,

Irving J. Selikoff, M.D.
Professor

IJS:ss

cc: E. Cuyler Hammond
Joseph Mondrone
Robert Klinger
Daisy Hayre

0323 :::8 AL-1

June 28, 1971

T. H. DAVISON, M.D. - Corporate Medical Director

In reviewing the records here at our Waukegan location I find that we have on file cases which have evidence of calcification of either the pleura or diaphragms or both without any restricted "flagging" of their records (i.e.: not designated as red cases).

I view of the changing climate in relation to pulmonary disease related to asbestos, I was wondering if perhaps we should either designate these cases as "red" cases, or perhaps an intermediate classification would be in order so that they would be restricted as to their dust exposure.

VINCENT C. SARLEY, M.D.
Waukegan

7/6/71
Talked to Dr Sarley -
to get list of pt's of "plaques" seen
at Waukegan

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Waukegan
July 13, 1971

V. C. Sarley, M.D. - 76

WORK RESTRICTION FOR PLEURAL OR DIAPHRAGAMATIC CALCIFICATION

As per our conversation I am in agreement that those file cases that we have showing evidence of either pleural or diaphragamatic calcification would justify flagging of the employee/patient's records with a no dust restriction.

It is my recommendation that we use the existing "Blue Slip Flagging" for this purpose for all such roentgenographic interpretations, not to include definitive pneumoconiosis cases which would be flagged as "Red Cases" as per standard procedure. Also, as per our conversation I would on counseling these employees for the reason of this restriction being placed upon them, emphasis that they are not being diagnosed as pneumoconiosis cases, but that sufficient pathological findings are present and that we are taking this precautionary step in their protection.

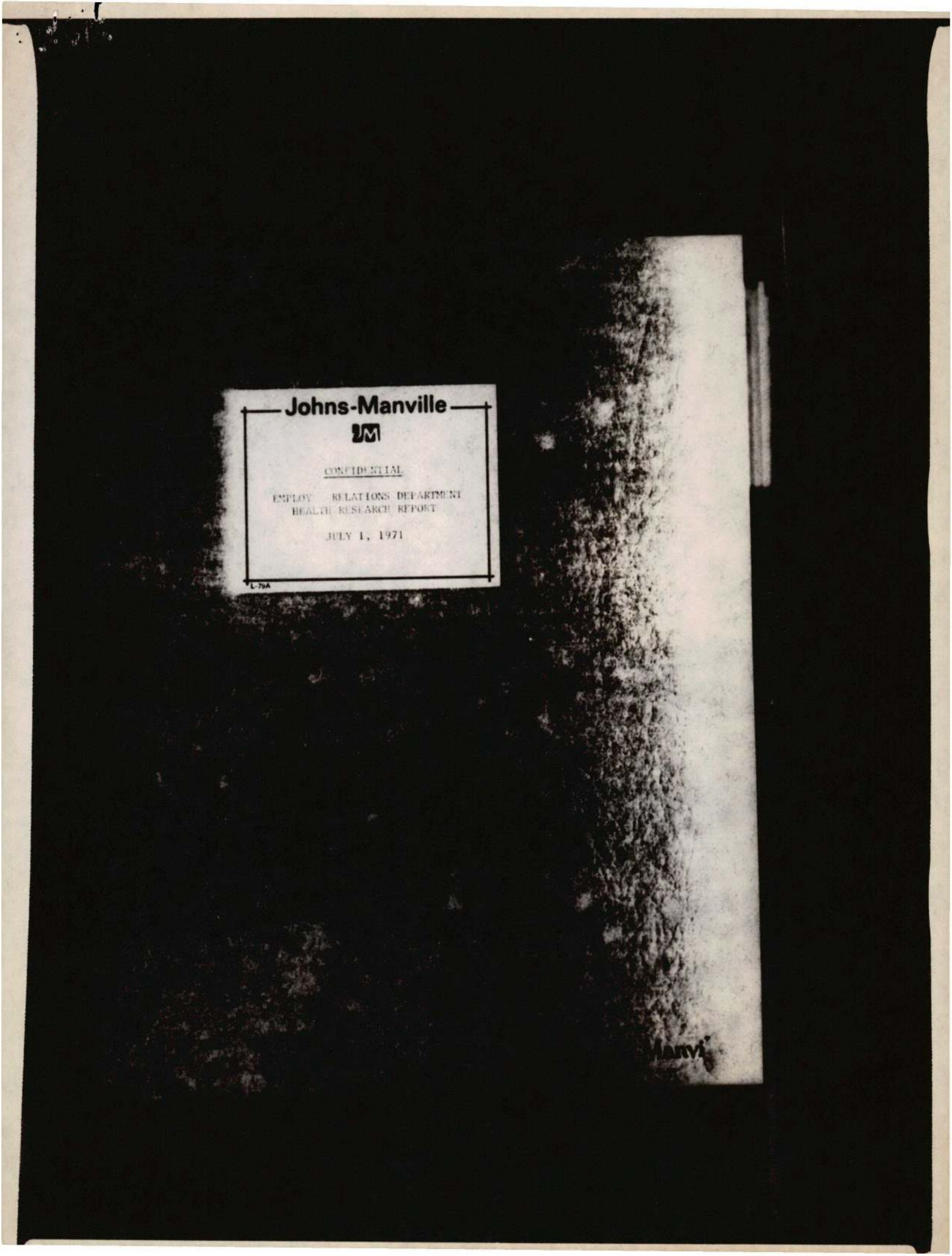
T. H. DAVISON, M.D.

cc
C. L. Hite - 81

5500 01187

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EMPLOYEE RELATIONS DEPARTMENT
HEALTH RESEARCH REPORT
JULY 1, 1971

To:

W. R. Goodwin
J. B. Jobe
F. H. May, Jr.
H. M. Ball
H. N. Bates
D. T. Colton
F. E. Dutcher
M. Harris
J. E. Hesse
J.R.M. Hutcheson
A. B. Marchant
G. H. Martens
H. B. Moreno
F. L. Pundsack
A. C. Smith
F. J. Solon
W. L. VanDerbeek

This report defines the status of Health Research Programs, including medical, research, and scientific studies, plus other related projects, in which Johns-Manville is actively participating.

H. M. Jackson

C. L. Sheckler

Dr. T. H. Davison
E. M. Fenner
M. B. Jamin

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EMPLOYEE RELATIONS DEPARTMENT
HEALTH RESEARCH REPORT
JULY 1, 1971

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HEALTH RESEARCH REPORT

The following is a progress report of health research studies in which Johns-Manville is actively participating.

FIBROUS DUST STUDY
INDUSTRIAL HEALTH FOUNDATION

This study involves the investigation of the health hazards of four various types of asbestos: chrysotile, amosite, crocidolite and synthetic. In addition, fibrous glass, mineral wool, and some organic fibers are being studied.

The portion of the study related to quantitating inhaled fibrous dust particles and ferruginous bodies found in the lungs has been completed. A paper entitled; "Fibrous Dust Particles and Ferruginous Bodies - Methods for Quantitating Them and Some Results From the Lungs of City Dwellers" by Paul Gross, M.D.; Jiri Tuma, ScD; and Robert T. P. deTreville, M.D., has been published in the July 1970 Volume 21 issue of Archives of Environmental Health.

The study of the inflammatory and onogenic components of the determination of the locus of pathogenicity of asbestos dust continues in progress since the animals will not be sacrificed but will live out their lives.

EPIDEMIOLOGICAL STUDY OF THE CANADIAN GENERAL POPULATION
INSTITUTE OF OCCUPATIONAL AND ENVIRONMENTAL HEALTH

This study proposed to relate the health status of asbestos-exposed population to the non-exposed population.

A paper entitled "Qualitative Aspects of Dust Exposure in the Quebec Asbestos Mining and Milling Industry" was presented at the Third International Symposium on Inhaled Particles, British Occupational Hygiene Society, London, September 1970, by G. W. Gibbs, Department of Epidemiology and Health, McGill University, Montreal, Quebec.

A paper entitled "Mortality in the Chrysotile Asbestos Mines and Mills of Quebec" by J. Corbett McDonald, M.D.; Alison D. McDonald, M D.; Graham W. Gibbs, MSc; J. Siemiotycki; and Charles Rossiter, M.A.; was published in the Archives of Industrial Health, Volume 22, June 1971.

Continuation of the study, approved by QAMA, will attempt to develop a basis for a Threshold Limit Value through a more definitive review of individual exposure histories and bronchogenic cancer involvement.

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HEALTH RESEARCH REPORT

ESTABLISH LIBRARY OF WORLD-WIDE ASBESTOS
RESEARCH AND HEALTH STUDIES
INSTITUTE OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH

This project is designed to assemble information on world-wide asbestos research and health studies for future reference and distribution upon request.

Gathering, codifying and indexing world-wide asbestos information is being continued by Dr. Pelnar.

ASBESTOS INDUSTRY STUDY
UNITED STATES PUBLIC HEALTH SERVICE

This is a 7 to 10 year environmental, clinical and epidemiological study of workers exposed to asbestos. This study was initiated in January 1963.

USPHS medical officers, along with Dr. R. Liss, Manville Plant, medically counseled some Textile Department employees under study. Others will be contacted by mail at a later date. The medical study portion of this study has been completed at the Manville Plant.

A paper entitled; "Health in Asbestos Textile Processing - Progress Report" by R. Knight, M.D.; H. Raymond, M.D.; R. Ligo, M.D.; R. Weidner, and L. Cralley, Ph.D.; was presented by W. Lainhart, M.D.; U.S.P.H.S. at the American Conference of Governmental Industrial Hygienists on May 24, 1971 in Toronto, Ontario, Canada. Dr. Lainhart indicated that 780 of the 2600 workers participating in the study have had physical examinations. 216 of the 780, the group over 50 years of age, have been medically evaluated. 17% of 122 males and 13.8% of 94 females had some positive medical findings possibly related to occupational exposure in asbestos textile manufacturing. 83% of the males and 85.2% of the females were found to have negative medical findings associated with their occupation.

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HEALTH RESEARCH REPORT

INSULATION INDUSTRY HYGIENE RESEARCH PROGRAM
MT. SINAI ENVIRONMENTAL SCIENCES LABORATORY

This is a combined industrial hygiene and preventive engineering research program designed to develop improved methods that will minimize exposures of insulation workers to dust and fumes encountered in their jobs.

IIHRP has subcontracted for three months with the Florida Institute of Technology to investigate portable, small room air cleaners for confined spaces, such as ships, and to make a preliminary investigation of the feasibility of very light weight, portable air supply respirators.

The composition of adhesives for fibrous glass insulating jacketings is being investigated as a possible cause of rashes and, in some instances, numbness of extremities. In the next few months, considerable attention will be directed to indirect exposures of shipyard workers at the Sun Shipyard near Philadelphia.

Recently the purpose of this program was misstated in the Bureau of National Affairs, Occupational Safety and Health Reporter, April 15, 1971 issue. This matter is currently being clarified.

FIBROUS GLASS AND MINERAL WOOL INDUSTRY STUDY
UNITED STATE PUBLIC HEALTH SERVICE

This is a 7 to 10 year environmental, clinical and epidemiological study of workers exposed to fibrous glass and mineral wool. This study was initiated in March 1968.

This study has been underway for approximately three years. Epidemiological data has been collected from the plants and is being processed through the Social Security records and will be further analyzed by Dr. Cralley's group to determine if there is an increased mortality among fibrous glass workers. It is expected that this study will be completed sometime within the next year.

The National Insulation Manufacturers Association is currently discussing an epidemiological study of the fibrous glass industry to supplement the work being done by the U. S. Public Health Service.

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HEALTH RESEARCH REPORT

BIOEFFECTS OF FIBROUS GLASS STUDY
INDUSTRIAL HEALTH FOUNDATION

The purpose of this study is to provide current and definitive knowledge of the bioeffects of fibrous glass on pulmonary function, emphysema, and human pulmonary tissue. It is sponsored by the National Insulation Manufacturers Association.

The experimental animal portion of this study is reported in the June 1970 issue of Archives of Environmental Health article; "The Pulmonary Reaction to High Concentrations of Fibrous Glass Dust". The conclusion is that fibrous glass dust is biologically inert.

Dr. Gross presented a paper entitled; "The Lungs of Workers Exposed to Fiber Glass", at the Third International Symposium on Inhaled Particles, British Occupational Hygiene Society, London, September 1970. This paper will be published in the near future.

Two papers were presented at the Industrial Health Foundation Annual Meeting in Pittsburgh, October 3rd, entitled; "Report of an Epidemiological Study: Part 1", by H. Michael D. Utidjian, M.D., and, "Results of a Comprehensive Physiological Study: Part 2", by Henry Lynn Hook, M.D. Both papers will be published in the near future.

EPIDEMIOLOGICAL STUDY OF J-M RETIRED EMPLOYEES
SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF PITTSBURGH

This is an epidemiological study to determine and analyze the life span, causes of death, and possible causal relationship to work exposures, of J-M retired employees. Comparisons will be made between this group and similar age groups in the general population.

The initial report covering operations which utilize silica, asbestos, diatomaceous earth as raw materials has been received and indicates that while the over-all mortality rate is comparable to that of the general population, there are certain types of causes of death which are higher than those found in the general population.

The study is being continued to include data on other manufacturing and sales locations.

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HEALTH RESEARCH REPORT

EXPOSURE OF INSULATION WORKERS TO AIRBORNE FIBROUS GLASS
UNIVERSITY OF CALIFORNIA

This is a study to define qualitatively and quantitatively the airborne concentrations of fibrous glass in the breathing zones of workers engaged in fabrication, application, finishing and other operations involved in installation of prefabrication and other fibrous glass insulation materials.

This study is being coordinated by the National Insulation Manufacturers Association Health and Safety Committee. A paper entitled; "Exposure of Insulation Workers to Airborne Fibrous Glass", by W. C. Cooper, M.D., J. L. Balzer, Ph.D., and D. P. Fowler, has been published in the American Industrial Hygiene Association Journal.

EVALUATION OF FIBROUS GLASS LINED AIR TRANSMISSION SYSTEMS
UNIVERSITY OF CALIFORNIA

This is a study to obtain quantitative estimates of amounts of fibrous glass introduced into living and working areas from ventilation or heating ducts lined with fibrous glass.

This study is being coordinated by the National Insulation Manufacturers Association Health and Safety Committee. A paper entitled; "Airborne Fibers in Relation to Fibrous Glass Lined Air Transmission Systems", by W. C. Cooper, M.D., J. L. Balzer, Ph.D., and D. P. Fowler, has been published in the American Industrial Hygiene Association Journal.

EPIDEMIOLOGICAL STUDY - NEW ORLEANS
TULANE UNIVERSITY

This two-year study of the health effects related to asbestos exposure in industry was initiated in December 1969. The physical examination portion of the program involving personnel of both National Gypsum and J-M plants in the New Orleans area is proceeding on schedule. The collation and analysis of employment and exposure records has been initiated.

The recent reduction in personnel at the Marrero Plant has had no adverse effect on the employee participation in this study.

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HEALTH RESEARCH REPORT

GENERAL POPULATION HUMAN PULMONARY TISSUE STUDY
INDUSTRIAL HEALTH FOUNDATION

This is a study to determine core identification of ferruginous bodies found in the general population autopsies.

The QAMA Scientific Advisory Committee has approved the Industrial Health Foundation's protocol and work is currently underway.

RESPIRATOR DEVELOPMENT
JOHNS-MANVILLE RESEARCH

Work is continuing in our cooperative development program with the Willson Products Company.

It appears that the new Bureau of Mines specifications for dispossible respirators cannot be met with a filter medium prepared by our wet forming process. There is some promise, however, that a dry formed filter medium using glass MICRO-FIBERS might be excellent for this application. This approach is being pursued in cooperation with the Willson Company. Willson Company has produced protocol models. These models are currently being evaluated.

BIOLOGICAL EFFECTS OF MODIFIED INORGANIC
FIBROUS MICROPARTICULATES
MT. SINAI ENVIRONMENTAL SCIENCES LABORATORY

This two-year program, initiated in October 1969, will investigate significant variations of biological effects of fibrous microparticulates that may occur following alterations on their surface and other physical-chemical properties. In vitro test systems will be used to identify the effect of modifications of several materials including chrysotile, crocidolite, glass-MICRO-FIBERS, MICRO-QUARTZ.

Dr. Schnitzer has begun animal studies with the interperitoneal injections to study the effect of modifications of fibers as a result of his work on hemolysis.

Based on Selikoff's reported prolongation of life of mesothelioma victims, Government sources have suggested the possibility of a Government-sponsored program directed towards the management of mesotheliomas. Dr. Selikoff verbally indicated his belief that up to one-third of mesothelioma cases may not be attributable to asbestos and believes that a program to identify co-factors or accelerating factors for mesotheliomas should be started with Government support. A review meeting on this program at Mt. Sinai early in the Fall has been proposed by Dr. Selikoff.

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HEALTH RESEARCH REPORT

FIBROUS PARTICLES IN AMBIENT AIR
UNIVERSITY OF CALIFORNIA

This is a NIMA study to determine the description of the type and concentration of fibrous glass particles to be found in ambient air. Secondary objectives are: (1) description of possible sources of fibrous glass, in terms of those general categories of human and natural activities and processes which appear to generate fibrous glass particles, with relative importance of each source to be assigned, in relation to the type of glass fiber produced, and, (2) description of the natural conditions which favor the presence of fibrous glass in the air, comparing the concentrations of fibers to the concentration of other particulates, and types of glass fibers in air with each other.

This study has been completed and a draft of the paper enticled, "Glass Fibers in Ambient Air", by J. L. Balzer, Ph.D., W.C.Cooper, M.D., and D. P. Fowler, has been completed. Subsequent to review of this paper it will be published.

SHEET METAL WORKERS OCCUPATIONAL EXPOSURES TO FIBROUS GLASS
UNIVERSITY OF CALIFORNIA

This is a NIMA study to define qualitatively and quantitatively the airborne concentrations of fibrous glass in the breathing zones of sheet metal workers engaged in the fabrication, application, finishing, and other operations involved in the installation of air transmission systems containing fibrous glass.

This study has been completed and a draft of the paper entitled; "Exposures of Sheet Metal Workers to Airborne Fibrous Glass", by J. L. Balzer, Ph.D., D. P. Fowler, and W. C. Cooper, M.D., has been completed. Subsequent to review of this paper it will be published.

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HEALTH RESEARCH REPORT

RELATIONSHIP BETWEEN THE DIMENSION OF FIBERS AND THEIR ABILITY TO PRODUCE TISSUE REACTION
ST. LUKE'S HOSPITAL, CLEVELAND

This is a study to further explore the relationship between the dimension of fibers and their ability to produce pulmonary tissue response.

Dimensional fibers of Coalinga chrysotile, synthetic chrysotile, crocidolite and glass have been prepared by J-M Research and submitted to Dr. G. W. Wright.

More than 700 guinea pigs have been injected intratracheally during this period. Of these, 328 died or were sacrificed and the lungs examined in detail. This high mortality was due to three factors.

1. Deliberate manipulation aimed at learning what fiber characteristics were required in order to get the individual fibers to the alveolar part of the lung, rather than have them lodge in a tangled mass in the bronchioles.

2. Infection associated with introduction of fibers.

3. Development of a new method of anesthesia characterized by virtual zero mortality, thus permitting repeated injections of fibers over a period of time.

At present the following classes of fibers are in animal groups for long term observation:

Five glass, five crocidolite, one synthetic chrysotile, one Coalinga, one sterile water controls.

For some of these there are separate groups that have received differing doses of fiber.

We anticipate receiving seven additional fiber samples for injection within the next few months. Projection over a two-year span of post injection observation will require this study to go through 1973.

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HEALTH RESEARCH REPORT

RESPIRATOR EVALUATION
McGILL UNIVERSITY

This is a study to determine the effectiveness of various types of respirators, including disposable respirators, to control the inhalation of asbestos fibre.

The study is being conducted by McGill University's "Institute for Mineral Industry Research", and is being sponsored by the Asbestos Fibre Division.

Filter media efficiency and resistance tests have been started on ten types of respirators. The first tests were conducted using asbestos fibre concentrations of 20 fibres per cubic centimeter of air. Evaluations were made with fibres 5 microns and over in length, also total fibres.

Two new disposable respirator styles will be introduced into the study.

Jeffrey Mine will use several types of disposable respirators that tested satisfactory in the initial filter media efficiency test for evaluating employee acceptance.

Considerable work will be required before any conclusions regarding total respirator efficiency can be determined. Face fit leakage tests will be equally as important as evaluating filter media. Face fit studies will follow the filter media tests.

MEETINGS, CONFERENCES AND GENERAL INFORMATION

A. National Insulation Manufacturers Association

The Health and Safety Committee developed and published a new booklet entitled; "Health Aspects of Fibrous Glass in Air Transmission Systems for Building Construction". It is to be used by sales and engineering personnel in the field, also by Division and Headquarters personnel responding to customer inquiries.

(Contd.)

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HEALTH RESEARCH REPORT

MEETINGS, CONFERENCES AND GENERAL INFORMATION

A. National Insulation Manufacturers Association (Contd.)

Our Health and Safety Committee appeared and testified at legislative hearings in New Mexico, California, Florida, Connecticut, Indiana, Nebraska, and Oklahoma.

Legislation was introduced in these states and would have eliminated the use of fibrous glass insulation on the interior of air transmission systems.

The reason for eliminating fibrous glass was stated as an alleged health risk resulting from eroding fibres.

Our NIMA Committee was successful in each instance in convincing the legislative committees, based on documented engineering and medical evidence, that studies over the past 30 years show fibrous glass to be a biologically inert substance which presents no health risk greater than any other nuisance-type dust.

We were also successful in our efforts to have the New York City Environmental Protection Agency remove references to elimination of fibrous glass from their original regulation draft. Work is presently underway with the New York City Department of Health sub-committees regarding the use of fibrous glass as an asbestos substitute in certain instances.

Our Health and Safety Committee has also appeared before Legislative and Environmental Committees in Los Angeles, Boston, New York State and Philadelphia. In these hearings we, along with the Asbestos Information Association, opposed the banning of asbestos product use and urged controls instead of elimination. Hearings are presently pending in Michigan and Illinois.

Our Medical and Scientific Committee has been continuing administration of medical research projects as heretofore described in this report.

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HEALTH RESEARCH REPORT

MEETINGS, CONFERENCES AND GENERAL INFORMATION

B. Perlite Institute

The Health and Safety Committee recommended to the Board that a radiologic evaluation of workers exposed to Perlite dust in member and non-member companies be made. The questionnaire concerning the willingness to cooperate and availability of x-rays has been forwarded.

The Board agreed to the recommendation of the Committee to accept the proposed Threshold Limit Value for Perlite dust at the inert or nuisance type dust threshold limit value recommended by the American Conference of Governmental Industrial Hygienists.

C. Asbestos Textile Institute

The ATI Environmental Health Committee is actively reviewing and circulating medical and scientific literature concerning fibrous materials.

Booklets entitled; "Recommended Health and Safety Practices", and, "Method for Determining Asbestos Dust Concentrations", have been published and distributed to member companies.

At the June 1971 Meeting, we presented a program describing the activities of the Asbestos Information Association of North America. W. P. Raines made the presentation for AIA-NA.

The ATI Environmental Health Committee is receiving increasing numbers of health inquiries regarding use of asbestos textile products.

Johns-Manville Papers on Worker Health, Pneumoconiosis Counseling and the OSHA Asbestos Standard, a Co…
ACL Doc 24642 · Page 221 of 352
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HEALTH RESEARCH REPORT

MEETINGS, CONFERENCES AND GENERAL INFORMATION

D. Asbestos Cement Products Association
Health & Safety Council

The ACPA Health and Safety Council has approved its Chairman appearing before legislative committees and environmental agencies to support control of dust from asbestos-containing products but vigorously oppose the banning of such products.

C. L. Sheckler presented an analysis of the Federal Occupational Health and Safety Act provisions at the recent meeting.

Johns-Manville Papers on Worker Health, Pneumoconiosis Counseling and the OSHA Asbestos Standard, a Co…
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63

EXHIBIT 0812-0063
FOR I.D. 2-2-84
MARY SCHLOFF, C.S.R.
WITNESS PUNDSACK

Johns-Manville Corporation

[redacted]

J'' RESEARCH
RECEIVED
1971

July 16, 1971

F. L. PUNDSACK

Irving J. Selikoff, M.D.
Department of Community Medicine
Mount Sinai School of Medicine
Fifth Avenue and 100th Street
New York, New York 10029

Dear Irving:

As I indicated in our discussion on June 24, we are most certainly willing and interested in cooperating with you in a program that will review and document the effectiveness of environmental control measures we have undertaken in the Manville operations.

In a general sense, we will say "yes" to your request for data as described in items 1, 2 and 3 of your letter of June 28.

In order to be more precise in our indication of the data we can verify or make available to you, your further description of the design and parameters of the study will be needed. Definitions of the cohort, time periods involved, exposure categories, and other facets of the study will enable us to determine what data we are capable of developing and the methods, time, effort and expenses to do it.

Our participation in the several other current studies of this type have made us aware that considerable effort and time are involved in record search and verification.

Your statement that the data, insofar as individuals are concerned, would remain entirely confidential is, of course, appropriate to a competent scientific study.

We would appreciate further comment on your relationship to the individual employee who seeks your counsel whether or not a problem of Workmen's Compensation is involved.

In this context, it is of interest to note that health counseling is a feature of our regular periodic medical examination procedures, and that all Manville-Finderne employees have been advised of significant findings, whether occupationally or non-occupationally related.

ACL 50

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I am sure that we will be able to make substantial data available to you for this study, both new and prospectively, and we welcome the opportunity to collaborate with you and Local 800 in this endeavor. There may well be data available to you and the union that would contribute to other health research studies we have undertaken. May we presume that reciprocal appreciation will be professed by you and the Local 800 management?

Sincerely yours,

J. D. Juhe
Executive Vice President - Operations

Copy to:

Mr. E. G. Stannard
Mr. J. F. Hyndman
Mr. R. V. Klinger
Mr. R. D. Hayes
Mr. A. D. Kirshner
Mr. F. J. Solem
Mr. F. L. Pundsack
Mr. Ivan Schwartz
Mr. H. H. Jackson
Mr. J. D. Anderson

J-M RESEARCH
RECEIVED
JUL 17 1971
F. L. PUNDSACK

AC 50

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Pittsburg Plant
September 20, 1971

TELEPHONE DISCUSSION WITH NICK TARARA RE OSHA ACT AND LTA REPORTING
THIS DATE

Regarding Nick's compliance bulletin #1 we are to disregard informing any former employees of any hazardous conditions they might have been exposed to. Should we get an inquiry from a former employee we should tell him we will look into the matter and our corporate safety office will give him an answer. Current policy is that Cliff Sheckler will handle all inquiries and that no information will be given out regarding conditions that existed prior to 8/23/71 which is the date of the OSHA regulations. However, we must notify current employees regarding exposure to any hazards above the limits established in the recent OSHA legislation.

E. Randolph should check the methods of notification. At this point it seems we should notify the men verbally whether they ask or not, making a record of the notification and explain to the man what it means in terms of personal protective equipment required, and what steps we plan to take to correct the situation.

With regard to the procedure for reporting LTA's with the Division, we are to Dupit-wire Gates and Tarara for each LTA occurrence giving a brief description of the nature and probable cause of the accident. As a follow up we are send Tarara a copy of OSHA Form #101, Supplementary Record of Occupational Injuries and Illnesses, together with the Supervisor's Investigation as to cause of the accident and recommend preventative action. The LTA wire will be initiated by the department head and the follow up by the Employee Relations Mgr.

Use Notes Make Copy - Send to Nick. Follow up to be done by IR.

A. C. PENNEWELL

cc: E. L. Randolph ✓
F/U @ Staff Meeting 9/24

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Environmental Control Department
Research & Engineering Center
October 1, 1971

"Near" I have no idea what "at" means by

TO: Division Production Managers
Plant Managers

cc: A. C. Smith
Division General Managers
H. M. Jackson - GHQ
C. L. Sheckler - GHQ
Area Industrial Hygienists
File & C

INDUSTRIAL HYGIENE SURVEY REPORTS

Until now, the interpretation of Threshold Limit Values has been that any station at or over TLV was unacceptable and required corrective action.

With the publication of the new Occupational Safety and Health Act Rules and Regulations, we have a specific federal interpretation of Threshold Limit Values. The statement under subheading Part G Occupational Health and Environmental Control is "Exposures ---- at a concentration above those specified in the threshold limit values shall be avoided ------". Under section 1910.95, Occupational Noise Exposures the wording is "Protection against the effects of noise exposures shall be provided when the sound levels exceed those shown in Table G-16 --------".

In view of this wording in the Federal Law, starting immediately, stations at but not over TLV will be considered as being under TLV.

G. L. Swallow

GLS/sw

AL 103 42 047

November 16, 1971

MEMORANDUM TO FILE

PRIVILEGED

cc: G. Earl Parker

ASBESTOSIS LITIGATION
MEETING WITH JOHN TUCKER, BEAUMONT, TEXAS
NOVEMBER 12, 1971

On November 12, 1971, Talmadge Neece of Travelers, Lyman Field and I, met with John Tucker and Gordon Pate in Beaumont, Texas to discuss the Borel and Potter asbestosis litigation.

John Tucker indicated that a motion for judgment on the verdict and a motion for judgment notwithstanding the verdict had been filed with the court in the Borel case. It is anticipated that a judgment will be entered in the very near future. The judgment will be against six defendants in the amount of $58,534.04. This reflects the actual damages, as determined by the jury, in the amount of $68,000 plus $1,652.94 for funeral expenses, $9,783.30 for medical bills, less $20,902.20, which was the amount paid in settlement by four other defendants in the case. Judge Fisher has indicated to Mr. Tucker that he will not order a new trial in the Borel case, as has been requested by Ward Stephenson.

It was decided by Talmadge Neece, Lyman Field and myself to keep John Tucker in the Potter case. We will definitely have a problem with the local bar and Judge Fisher if Mr. Tucker is removed. The local bar in Beaumont is a very closely knit group. Mr. Tucker is a proud man and will obviously be offended if he is removed from the case. We felt that it was worth sacrificing something in the Potter case to make sure that he does a good job for us on the Borel appeal. Lyman Field will sit in and assist Mr. Tucker during the Potter trial, which probably will be scheduled for sometime during January of 1972. It is conceivable, that Ward Stephenson will postpone the Potter trial at the last minute. Ward advised John Tucker that Mr. Potter is near death and therefore he wants to try the case as soon as possible. Gordon Pate feels that Mr. Potter is pressuring Ward for some money, and Ward is testing the defendants to see if by scheduling the trial for January he will be able to obtain some settlements prior to trial. A final pretrial conference in the Potter case has been scheduled for mid-December. Lyman Field will attend this conference and will be introduced to Judge Fisher and recorded as "of counsel". It was decided that Gordon Pate will forward the X-rays, medical records and depositions of the various doctors who have examined Mr. Potter to Dr. Hans Weill in New Orleans, for review to make sure that Mr. Potter does in fact have asbestosis as has been alleged and to determine if Dr. Weill wants to examine Mr. Potter in Beaumont prior to the trial.

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This week Lyman Field will write a letter to Page Keeton, Dean of the University of Texas Law School, and advise him that the writer has been retained by Travelers, at the request of Johns-Manville, that he is impressed with the brief prepared by Dean Keeton and would like him to play a significant role in the Borel appeal. If Dean Keeton is interested in getting involved in the Borel appeal, Lyman will set up a meeting with him in mid-December when he comes to Beaumont for the pre-trial conference in the Potter case. Lyman will delicately attempt to maneuver the situation so that Dean Keeton prepares the brief in the Borel appeal and lets Mr. Tucker sign it and Dean Keeton will be listed as "of counsel". If this is accomplished, shortly prior to the argument of the appeal, we will attempt to get Dean Keeton to present the oral argument at the appeal and at that time remove John Tucker from the Borel case and all other pending asbestosis litigation in Beaumont. In any event, Lyman Field will review and revise our brief on appeal, whether it is prepared by Dean Keeton or John Tucker.

While I was in Beaumont, I was advised that Ward Stephenson filed a new asbestosis suit in the U. S. District Court in Beaumont, Thomas S. Hartwell vs. Johns-Manville Products Corporation, et al., on November 11. A copy of the complaint has been obtained from the court. After our meeting with Mr. Tucker, Talmadge Neece of Travelers agreed to write a letter to Gordon Pate assigning this new case to him, with Lyman Field as co-counsel. John Tucker will receive a copy of this notification and will be advised that Travelers and Johns-Manville feel that he is too busy with the Borel appeal, Potter trial, and the other two asbestosis suits in Beaumont (Crawford and McDaniel) to get involved in this new case. Such an approach should psychologically assure Mr. Tucker that he is not going to be removed from the Potter and Borel cases. Since only Johns-Manville Products Corporation and Owens-Corning Fiber Glass Corporation are named as defendants in the Hartwell suit, we must consider impleading other manufacturers of insulation products containing asbestos, as we have done in the McDaniel case. It has been decided to promptly schedule the deposition of Mr. Hartwell to determine what other manufacturers' products he was exposed to in addition to those of the named defendants. The complaint does admit that he worked with insulation products of other manufacturers. The deposition of Mr. Hartwell will be scheduled for January in order to keep Ward Stephenson busy so that he won't have too much time to prepare for the Potter trial. After the taking of Mr. Hartwell's deposition, we will then implead various other manufacturers as third-party defendants.

John Tucker was much friendlier at our Friday meeting and more cooperative than he was during the Borel trial. However, Talmadge Neece and Lyman Field observed his disorganized manner and lack of comprehension of many important aspects of these cases.

I indicated to Lyman Field that I will forward a copy of Page Keeton's brief to the attorney representing Johns-Manville in the Bassham case in New Mexico. In addition I will schedule a trip to Albuquerque to review the Bassham case with our attorney and to evaluate his competence. I will have our New Mexico counsel prepare a draft of our brief on appeal for my review and for review by Lyman Field.

Lyman Field and I agreed not to revise our warning label on asbestos products until after the Borel appeal is decided, so as not to prejudice our case on appeal. We do not want the judges on appeal to learn of our change of the warning label subsequent to the Borel trial. This may indicate to the court that we felt the warning label was not adequate.

Talmadge Neece has retained Lyman Field to represent Johns-Manville Sales Corporation in the Harrod case which was filed recently in Kansas City, Kansas. Lyman will immediately get a copy of the original complaint which was filed. We were served with a copy of an Amended Complaint but have never been served with the original complaint. Lyman will promptly, through discovery, ascertain Mr. Harrod's age, pre-1964 work experience to see if there is any prior exposure which could have contributed to his current alleged respiratory problems and will obtain Mr. Harrod's Workmen's Compensation records and all medical reports for evaluation. This case differs from the other asbestosis cases which have been filed, in the following ways:

1. Only seven years of exposure to asbestos insulation products is alleged.

2. All of Mr. Harrod's exposure was during the period when J-M had warning labels on our asbestos insulation products. Since the complaint alleges that J-M was negligent in failing to warn the plaintiff of the possible harm from use of our products, I assume that plaintiff's counsel was not aware of the existence of our warning labels.

3. All of the plaintiff's exposure was with one insulating contr

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4. There is no allegation that the plaintiff has asbestosis or mesothelioma. It is merely alleged that he is experiencing various respiratory problems and has a "fibroid condition". This may be an emphysema case.

Richard P. Carter

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Environmental Control Department
Denver GHQ
December 27, 1971

H. B. Moreno

cc: J. E. Hesse - Finderne
H. M. Jackson - New York GHQ
G. L. Swallow - DHQ
R. M. Billings - New York GHQ
C. L. Stake - Manville
File

EMERGENCY STANDARD FOR EXPOSURE TO ASBESTOS DUST
YOUR LETTER OF DECEMBER 22, 1971

H. M. Jackson, G. L. Swallow and I have discussed your proposal to train a salaried employee at each of four of your plants in order that they may take personal air samples to determine asbestos fiber dust concentrations. The reason for your proposal is, of course, to speed the flow of information regarding corrective measures taken at these plants.

The type of service you are seeking is already available and in practice at both Manville and Waukegan where approximately 90% of your problems exist. Because we already have Industrial Hygiene laboratories at these locations, special surveys have been and are being made regularly and almost continually at the request of your plant managers. We have on numerous occasions been told by these people that the service was entirely satisfactory for their needs.

The promptness with which survey results have been submitted to your plant managers has been a function of the urgency involved. Our reports have varied from over-night service to a matter of several days or weeks when a low priority was involved. With your more urgent need for fast results, we can rearrange our priorities and give you whatever service is required.

The Manville laboratory has conducted special surveys at Billerica on several occasions and can continue to do so, again with greater speed as greater urgency demands it. Since Billerica is within a day's drive or a few hours by air and automobile combination, we can give service at least equal to what you could achieve through sampling with your own people and depending upon the mail service to transport your samples to the laboratory.

While Laurinburg is somewhat less accessible than Billerica, we can here again provide service equal to or better than any other means.

There are a number of factors which make the use of plant salaried employees as "sample takers" somewhat more complex than one might at first think.

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Seldom will a single pump suffice for sampling an operation where you are looking for definitive information. To determine how to correct a dust situation or to determine what improvement you have made, multiple samples should be employed. This requirement plus the normal maintenance required on pumps makes it essential that you have about six rather than one pump. You would also need battery chargers for each. Additionally, frequent calibration is required if the results are to be accurate. You would therefore require a wet test meter also. The approximate cost of these items is $1,600, not including any provisions for maintenance, storage and general laboratory facilities.

We feel that to whatever extent we attempt to use data obtained by local plant people, our credibility would be impaired particularly insofar as OSHA is concerned. The sampling procedure is acknowledged by all to be approximate at best, and any departure from the use of thoroughly trained and experienced people further depreciates the accuracy and credibility of the data.

Paragraph 4 of your letter discusses a master list and a book of all stations. Each plant presently has a master list of all stations and in addition has a history going back to the base survey of all stations; dust, fume and noise; that have been or are now over TLV. The practice of having complete Industrial Hygiene Survey permanent record books at each location was discontinued approximately two years ago at the request of the legal department. Preparation of new complete books for each plant would be a difficult and time-consuming task since we would have to duplicate the books that are on file here. Special reports are now provided each plant for discussion with OSHA inspectors whenever necessary.

Paragraph 6 of your letter discusses notification to H. M. Jackson and Industrial Relations Department of all inspections and citations. The Environmental Control Department also should be notified of any OSHA inspection and citation. H. M. Jackson now receives the same information concerning Industrial Hygiene Surveys that plant management does.

May I please have your comments.

E. M. Fenner

EMF/lh

Environmental Control Department
Denver GHQ
December 27, 1971

OSHA

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May I please have your comments.

E. M. Fenner

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NATIONAL INSULATION MANUFACTURERS ASSOCIATION, INC.
7 KIRBY PLAZA - MT. KISCO, N.Y. 10549
(914) 241-2284

B!

March 10, 1972

Arthur M. Goldberg
Hearing Examiner

HEARING ON PROPOSED STANDARD
FOR EXPOSURE TO ASBESTOS DUST
BEGINNING MARCH 14, 1972

I am Clifford L. Sheckler, Chairman of the Safety and Health Committee, National Insulation Manufacturers Association. I am appearing before you today, along with Mr. Spence Royer, representing the National Insulation Manufacturers Association and the National Insulation Contractors Association.

The membership of both Associations wish to express opposition to the proposed standard for asbestos dust as published in the Federal Register, Wednesday, January 12, 1972. Also, we wish to express our opposition to the recommendations of the Advisory Committee on asbestos dust, and the National Institute for Occupational Safety and Health criteria document.

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The National Insulation Manufacturers Association represents the manufacturers of Thermal Insulation products in the United States. The National Insulation Contractors Association represents the major Thermal Mechanical Insulation Contractors engaged in both the construction and shipbuilding industries throughout the United States.

Our comments will be directed specifically to the application of asbestos containing insulation products and not to the manufacturing of such products.

The construction and shipbuilding work currently underway by our Thermal Mechanical Insulation Industry is being done under both government and private contracts. Federally funded contracts involve office buildings, hospitals, schools, libraries, missile facilities, defense projects, dams, airport facilities, rapid transit systems, low rent housing, military housing, air and water pollution projects, shipbuilding and ship repairing for the U. S. Navy - Coast Guard - Merchant Marine and Army.

Private funded contracts include office buildings, hotels, theatres, refineries, power generating plants, chemical plants, other types of industrial plants, housing, University buildings, hospitals, and others.

We, in the thermal mechanical insulation construction industry, excluding the manufacturing of insulation products, and considering only the installation of this material, directly involve approximately 40,000 job opportunities in the United States.

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This industry represents an approximate $700 million gross volume of business annually.

Our industry is comprised of over 1000 contractors. Most of these contractors are small businessmen spread throughout the United States. Mr. Royer, who is here with me today, is one of the small businessmen who will present you with his views.

Our opposition to the asbestos dust standards are based on the fact that they are neither reasonable, practical, feasible, or economically sound. Much of the information for establishing the proposed asbestos dust standards, the NIOSH criteria package, and the Advisory Committee's recommendations, was gathered from experience in this Thermal Mechanical Insulation Industry.

Let us review the course of events concerning the threshold limit value for asbestos dust over the past few years. In 1970 the American Conference of Governmental Industrial Hygienists Threshold Limit Value for Asbestos Dust was published at 5 million particles per cubic foot of air as measured with the impinger method. We were able to work with this standard. At that time the majority of State Departments of Labor and Health maintained the same Asbestos Threshold Limit Value. In December 1970, the Occupational Safety and Health Act became law. In 1971, the first set of safety and health standards became effective. The threshold limit value for asbestos dust then became 12 fibres per milliliter greater than 5 microns in length as measured by the membrane filter. This industry did not question the reduction of the threshold limit value from 5 million particles per cubic foot to 12

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fibres per milliliter, and the complete change of the method for monitoring asbestos dust, instead, we immediately went to work by introducing new methods, equipment, and materials, to reduce dust levels to within the 12 fibre limit. On December 7, 1971, Emergency Asbestos Dust Standards were published in the Federal Register again reducing the Threshold Limit Value for Asbestos Dust from 12 fibres per milliliter greater than 5 microns in length to 5 fibres per milliliter greater than 5 microns in length. On January 12,1972, the proposed asbestos dust regulations, with a Threshold Limit Value of 5 fibres, was published in the Federal Register. Thus far, in conjunction with these proposed regulations, both NIOSH and the Asbestos Advisory Committee have made recommendations for further reduction of the Threshold Limit Value for asbestos dust to 2 fibres per milliliter greater than 5 microns in length. You now have a picture of the inconsistency and uncertainty involved in the establishment of an Asbestos Dust Standard.

From 1970 to-date, a period of just over two years, the Threshold Limit Value for asbestos dust has been changed from 5 MPPCF to 12 fibres, then to 5 fibres, with a current recommendation for a 2 fibre level. With each of these Threshold Limit Value changes there have been many other related requirement changes that add to the total confusion, such as, respiratory equipment, dust collection, vacuum cleaning equipment, and others. The change from 5 MPPCF to 12 fibres has been a costly one. Our industry has, with some difficulty, absorbed this cost. We frankly cannot meet the 5 fibre Emergency Asbestos Standard as currently effective, nor can we absorb the cost of the Emergency or Proposed Asbestos Standard and its related provisions. It is needless to say, therefore,

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that to achieve a 2 fibre standard as recommended by the NIOSH Criteria Package and the Asbestos Advisory Committee, is neither practical, feasible, or economically possible.

Let's carefully examine the reasoning for the erratic revisions of the Asbestos Threshold Limit Value since 1970. As I have already told you, much of the information which contributed to these revisions was gathered from our Thermal Insulation construction industry. At its best, this information is scanty, inconsistent, incomplete and inaccurate. First of all, I told you that at the change of Threshold Limit Value from 5 MPPCF to 5 fibres per milliliter, there was also a change in the method for monitoring asbestos dust from the standard or midget impinger to the membrane filter. There is absolutely no method for correlation between the asbestos dust counts determined by monitoring with the impinger as compared to the membrane filter. It is, therefore, impossible to compare the exposure levels in terms of numbers of fibres per milliliter greater than 5 microns in length with numbers of particles of total dust when using the impinger method. It must be recognized that the impinger method included particulate matter other than asbestos fibre.

Physical examinations on a part of the work force installing Thermal insulation materials have been conducted. The disease involvement determined by these physical examinations has been related to the present day asbestos fibre exposure as monitored by the milapore filter method. These factors can not

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be compared or related. Also, based on supposition and assumption, it was concluded that the exposure levels of men working in construction and shipbuilding before, during, and subsequent to World War II were at the same levels of exposure as is a worker engaged in similar activities today. This hypothesis is not true. The types of materials have changed, the percentage of asbestos contained in thermal insulation products has been reduced, the method of installation has changed, and fabrication equipment has changed. Each of these changes since the early 1940's has contributed in the reduction of dust levels. It is, therefore, illogical to compare disease occurrences which resulted from exposure from 20-30 years ago with dust levels monitored on construction sites within the last several years. It is also illogical to compare our American industry with that of foreign countries.

As I said, we have withstood the change from 5 million particles per cubic foot of air to 12 fibres based on insufficient information gathered from small segments of the industry. Although there was no further input of pertinent information, again, based on supposition and assumption, the level was then reduced from 12 fibres to 5 fibres. Now, still based on supposition and assumption, with no further information available, both NIOSH and the Asbestos Advisory Committee are recommending a reduction to 2 fibres. While these reductions in the Threshold Limit Value have been readily forthcoming, the proposed regulations, NIOSH Criteria Package, and the Asbestos Advisory Committee recommendations are completely void of any

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references to prohibiting or restricting workers who are habitual cigarette smokers from working with products containing asbestos fibre. The same studies, upon which much of the emphasis has been placed concerning the reduction of the Threshold Limit Value, also demonstrate drastic effects of cigarette smoking when associated with the pulmonary disease, Asbestosis.

As I told you, we have not achieved the level of 5 fibres. We are making a decided effort to do this. We have problems unique to the construction industry in attempting to comply with the proposed asbestos standards. I am not at this time going to review all of the minute problems involved in the application of these standards, instead, I am going to speak to the economics of achieving this proposed standard of 5 fibres per milliliter 5 microns and greater in length as published in the Federal Register January 12, 1972. We feel, with the economic impact that this regulation will have on the Federal Office of Budget Management, other Federal agencies, including the Armed Services, and on private enterprise, it is worthy of very careful consideration by the Federal Department of Labor.

We brought together a number of the foremost contractors in the Thermal Mechanical Insulation Industry and together we evaluated the cost of complying with the proposed asbestos regulation. This was accomplished by breaking down the regulation into each of its requirements and computing them individually. The requirements were computed individually, included

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monitoring, based on purchasing the monitoring equipment and having the samples analyzed at a private laboratory; respirators of the disposable type; physical examinations; dust collection and vacuum cleaning equipment; warning signs; protective clothing; and work placement. As a base we used a 100-man contracting unit with 25% of the unit working with asbestos containing products. We computed off-job time and lost time productivity at an average construction worker's rate. The total cost for implementing a program to comply with the proposed Asbestos Dust Regulations as published in the January 12, 1972 Federal Register for a 100-man construction unit, 25% of which worked with asbestos containing materials, is $795,375.00 direct expenses per year - $27,740.00 administrative expenses per year, and $16,700.00 of capital expenses, therefore, a total for the 100-man unit, with 25% engaged in work with asbestos containing products, amounts to $839,815.00 increased construction expense for the purpose of complying with the proposed Asbestos Dust Regulation. This represents an increased labor cost of 168% that must be passed on to the customer in order for a contractor to survive. The customer, in many instances, is the Federal Government and the Office of Budget Management. Considering the inadequacy of medical and scientific research information concerning safe exposure levels of asbestos dust, and also considering the supposition and assumpiton on which the proposed Threshold Limit Value is based, it is difficult to imagine a justification for the economic stress this regulation will place upon the construction industry, Federal Government, and private enterprise.

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We respectfully urge the Secretary of Labor to:

1. Reinstate the Threshold Limit Value for Asbestos Dust at 12 fibres per milliliter 5 microns or greater in length, for an interim period.

2. To initiate a comprehensive epidemiological study of the entire asbestos industry as it exists in the United States; and to determine not only the effects of asbestos but also asbestos associated with other airborne contaminants and cigarette smoking.

3. To provide adequate lead time prior to the effective date of reduction of any Threshold Limit Value in order that the construction industry, operating on fixed contracts, can cope economically with the increased costs that such a reduction will create.

4. To provide definitive information concerning the specific requirements of the regulations.

5. Provide our trade associations with representation on future Study and Advisory Committees.

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We, representing the construction industry, have been moving forward to provide safety and health information and implement safer working conditions. We intend to continue and accelerate this program. It is our desire to provide every possible protection for our people.

Thank you for the opportunity of appearing at this public hearing today.

C. L. Sheckler
Chairman, Health and Safety Committee
NATIONAL INSULATION MANUFACTURERS ASSOCIATION
NATIONAL INSULATION CONTRACTORS ASSOCIATION

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Statement by George W. Wright, M.D., Head of the Division of Medical Research in the Dept. of Medicine of St. Luke's Hospital, Cleveland, Ohio

before

U. S. Dept. of Labor, Occupational Safety and Health Hearing on proposed occupational asbestos standard

Washington, D.C.
March 16, 1972

My name is George W. Wright. I am the Head of Medical Research in the Department of Medicine of St. Luke's Hospital, Cleveland, Ohio. In 1932 I received the MD degree from Indiana University School of Medicine. After five years of Post Graduate Training in Internal Medicine with special training in pulmonary disease I spent two additional years in research training in the Department of Physiology at Case-Western Reserve University. From 1939 to 1953 I was a member of the Saranac Laboratories of the Trudeau Foundation engaged in studies of the pneumoconiosis, including asbestosis. Since 1953, I have continued this general field of study in my current position.

My statement will be confined to consideration of a single primary question. This question is: What is the quantity or concentration of asbestos, in the air breathed by those engaged in the production, manufacture or use of asbestos products, which can be tolerated for a normally expected work life without risk that such exposure will cause disease? The answer to this question goes to the heart of these hearings. While the question is rather easy to formulate it is difficult though not impossible to answer.

The obligatory information required for developing an answer to the primary question on an acceptable scientific basis is of two categories. One of these essential categories concerns the dose or quantity of asbestos inhaled and the other essential category concerns the biological response. What we need to learn is the dose-risk relationship.

The dose is estimated in terms of concentration of respirable asbestos in the air multiplied by the duration of the

exposure. It is obligatory that we establish a dose, in measurable terms, at which the biological manifestation of disease occurs and then, by observing populations exposed to progressively smaller and smaller doses, determine the level at which the biological reaction to asbestos no longer occurs. To make observations with regard to the various dose levels of different working populations without knowledge of the biological response of these same populations is of no use in answering the primary question. To make observations of the biological response in various working populations without valid knowledge of the different levels of asbestos exposure experienced by these same populations is equally of no use for finding an answer to the primary question. Standards for a safe level of asbestos exposure proposed or set in the absence of reliable and valid data in both of these two categories must be considered empirical and to some degree abritrary and should be recognized as such.

I wish to indicate some of the difficulties encountered in efforts to obtain the information essential for determining what the safe level of asbestos in the occupational environment truly is.

Asbestos is a generic term embracing four varieties that are in common commercial use. Of these, chrysotile is used in largest quantities followed by crocidolite, amosite and anthophylite. Each of these has different chemical and physical attributes. Some working populations are exposed to only one variety of asbestos while others are exposed to two or more simultaneously and in varying proportions. Thus there are several

kinds of populations each exposed in quite different ways to one or more kinds of asbestos, each of which might react biologically in a different manner. Moreover, workers exposed to asbestos are further exposed simultaneously to other airborne agents. In production, manufacturing and utilization processes these may differ greatly. For example, the asbestos producer is exposed to asbestos with minimal coexisting agents while, in contrast, the insulation manufacturer inhales asbestos plus silica plus other pneumoconiosis producing dusts. Insulation applicators inhale these materials plus a variety of additional agents present in whatever the environment is in the place where he is working at that time. Attention to such coexisting agents has been ignored in most studies, especially those of insulation workers. Variations of type of fiber and the circumstances surrounding their use must be taken into account in answering the primary question and would suggest the possibility that different standards might be rational in order to meet different conditions of use of asbestos.

There are four, totally different biological phenomena or diseases thought to be related in some way to the inhalation of asbestos fiber. These are pulmonary fibrosis, bronchogenic cancer, thickening of the pleura, and mesothelioma. Not a single one of these diseases is peculiarly related to or caused solely by the inhalation of asbestos fiber. Each of these four diseases occurs de novo or for other reasons in persons who have never been exposed occupationally to asbestos. The fact is, the biological reaction attributable to asbestos is not a

specific kind of disease induced solely by asbestos. Instead, the biological reaction to asbestos manifests itself by the fact that in some populations occupationally exposed to asbestos, there is, in contrast to non-exposed populations, an excess occurrence of one or more of the four previously mentioned diseases. To determine the safe level for the use of asbestos, we are required to demonstrate the level of exposure to asbestos at which no excess of disease develops when the exposed population is compared to a non-exposed population. In order to establish a safe level we must examine suitable control populations not exposed to asbestos, but age matched and residence matched, from which population one can learn the frequency of occurrence of the specific diseases in question. In addition, we must examine an exposed population, which can be ranked in various levels of exposure, in order to learn at what level an excess of these diseases occur in the exposed population. The observation of a biological abnormality in only one or two persons who have been exposed to the inhalation of asbestos fibers does not permit a comparison to suitable control groups or afford contrasting exposure values. Such observations are of no use for determining a safe level standard. Isolated case reports of mesothelioma, bronchogenic cancer or pulmonary fibrosis in individuals who may also have had an exposure to the inhalation of asbestos fiber are of no use in setting a safe standard for asbestos based upon sound scientific principles. Larger populations in which only the frequency of occurrence of disease is reported, without the necessary data indicating ranges of exposure and in which no attempt to relate variations of exposure to disease is made, fall into the same non-

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usable category for setting a valid safe level. This is not to say that observations in such groups are of no value for other purposes, but the issue should not be confused by introducing data from such inadequate studies into considerations of safe levels of asbestos exposure. Suitable control populations made up of individuals in sufficient number who were never exposed to the occupational inhalation of asbestos fiber and occupational groups whose exposures are demonstrated to have wide variation are difficult to obtain but absolutely essential for our purpose. The absence of this kind of control data, excused or overlooked on the basis that it cannot be obtained, is an unacceptable condition if the safe level standard is alleged to be set on the basis of universally accepted scientific principles.

There is difficulty also with assessing the frequency of occurrence of the diseases thought to be related under some circumstances to the inhalation of asbestos fiber. There is disagreement as to the criteria for a valid diagnosis of mesothelioma. The criteria for a diagnosis of "asbestosis", especially in its least severe manifestation, are not generally agreed upon. The use of the chest x-ray for diagnosing the early manifestation of asbestosis is a case in point. A recent report by Murphy and his co-workers of a study of employees in a shipyard demonstrated that twenty percent of the control, or non-exposed population gave evidence of x-ray abnormalities which, if observed in the exposed population in the absence of controls, in all probability would have been interpreted as being evidence of the effect of the inhalation of asbestos fibers. In a population

which has been exposed to asbestos inhalation, it is very tempting to ascribe any departure from a perfect appearance in the chest roentgenogram to the occupational exposure, and indeed, in some studie this has been done. It is imperative to recognize that some persons who have never had an occupational exposure to asbestos will show the same x-ray shadows that have been interpreted by some as evidence of asbestosis in populations exposed to the inhalations of asbestos fiber. Studies such as those by Murphy et al exemplify the necessity of having suitable controls included in epidemiological studies bearing on the determination of a safe standard for asbestos.

There are still other difficulties having to do with establishing the dose-risk relationship. The health effects of asbestos inhalation are both dose and lapse-time related. Overt evidences of asbestosis do not appear until years after the initiation of the exposure. The interval between onset of exposure and its effect is even greater for the development of bronchogenic cancer or mesothelioma. This interval ranges between twenty and forty years. Because of the long time lapse between the initiation of exposure and the manifestation of injury, the incidence of disease occurring in populations now under study is the result of, and must be related to, exposures which took place twenty to forty years or more ago. To relate exposure measured only in the past five or so years to the current frequency of development of disease which actually was induced by exposure occurring years earlier, is a serious error. During the past twenty-five to thirty years there have been many technicological changes in the production, manufacture and use of asbestos containing material. In many situations there is much

less asbestos now being incorporated in the material than was true twenty or more years ago. In addition, there has been a progressive dust control effort to reduce the concentration of airborne asbestos in mines, mills and manufacturing establishments in a deliberate attempt to reduce and abolish asbestos related disease. So much has been accomplished in this direction by technicological change and systematic asbestos control efforts, that contemporary measurements of occupational environments cannot be accepted as representative of conditions twenty to forty years ago.

To summarize this part of my statement I strongly urge that when data offered in support of setting a safe level standard is being judged, one should ask the following questions:

1. What were the different kinds and proportions of asbestos used and what were the coexisting agents to which workers were exposed in the different occupations?
2. What were the specific criteria and methods used, and were they adequate for making a diagnosis of the biological reaction attributed to the inhalation of asbestos?
3. Were suitable controls in the sense of non-exposed populations and exposed populations whose exposures varied in intensity and duration utilized?
4. Was the exposure [redacted] actually responsible for the disease properly determined or were contemporary dust estimates inappropriately applied to disease which was in fact the result of exposure years ago?

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The demands inherent in these questions pose formidable obstacles to arriving at a scientifically valid single number which will indicate the concentration of occupational airborne asbestos that can be tolerated with safety for the customary duration of employment. In spite of this, as I will show later, there are substantial data which will satisfy the requirements posed by these questions and which can be used for the purpose of determining at least a first approximation to the safe level of occupational exposure to airborne asbestos.

We must now examine the various established and proposed standards for a safe level of asbestos in the occupational environment, in the light of the just discussed requirements as to data needed for setting a standard on a sound scientific basis. Systematic efforts to reduce the amount of asbestos in the air of working places by governmental directive was made in the factories of Great Britain beginning in 1931. No numerical standard for this purpose was set, but Statuatory Rules and Orders were promulgated. Later, on the basis of limited data relating impinger dust counts to x-ray abnormalities in several asbestos textile factories of the USA, Sayers and Dreeson suggested a numerical standard of five mp/ft^3 as a tentative safe level. This was the limit adopted by the American Congress of Governmental Industrial Hygienists in 1946. Utilizing the conversion data for textile mills published by Lynch and Ayers of the U. S. Public Health Service, five mp/ft^3 is the equivalent of approximately thirty fibers/cc.

In 1968 the British Occupational Hygiene Society suggested numerical guides aimed at reducing the risk of developing asbestosis.

The suggested guides indicate that those concentrations, averaged over a three month period below 2 fiber/cc ought to be considered low, and that over the course of 50 years of employment, 100 fiber years is the level below which there would be less than a 1% chance of developing asbestosis as defined chiefly by the presence of rales. If asbestosis is defined by x-ray abnormality, the level becomes 135 fiber years. In 1968 the ACGIH changed its recommended standard to a TWA of 2 mp/ft^3, or twelve fibers/cc. In 1970 this Committee decided to change the standard to 5 fibers/cc, which is equivalent to less than 1.0 mp/ft^3. Several months ago OSHA set an emergency standard of 5 fibers/cc, and within the past few days NIOSH now proposes a standard of 2 fibers/cc.

What is the scientific basis for these various standards? The standard proposed by Sayers and Dreeson did attempt to relate dose of dust containing asbestos, as measured by the midget impinger to the risk of developing pulmonary abnormalities in terms of abnormal x-ray patterns. Their study showed a higher frequency of abnormal x-ray patterns in those most heavily exposed as contrasted to those less exposed. They found no excess of abnormal chest x-ray patterns in those workers exposed to less than 5 mp/ft^3. Hence their suggested standard of 5 mp/ft^3. We now know, however, that the population studied was not observed long enough for the full range of disease to develop. The authors appreciated this possibility and proposed the standard as being a tentative one. In retrospect we know that the standard, although it led to marked lessening of the dustiness in some occupations, was not adequately based and the passage of time has demonstrated it to be an inadequate standard.

The numbers proposed by the British Occupational Hygiene Society are based on a study of 290 male employees from a single asbestos textile mill. Their employment began after 1933, all had worked for at least ten years, and the exposure period extended from 1933 until 1966. The indicator of disease was basal rales and x-ray changes. No measurements of dustiness in this mill were available prior to 1950. Membrane fiber counts done in the modern manner were used only in the last year of the study and these served as the factor for converting previous counts using other methods to an expression in terms of fibers. To obtain an index of exposure for the period between 1933 and 1950 - a crucial period of exposure - the first measurements made in 1950 were raised by 50%. No evidence was given for using this very slight augmentation. Studies in other textile factories such as those by Sayers and Dreeson indicate that when ventilation controls were first applied in their textile mills the dust counts dropped 1,000% or more. One would assume that the same happened in this British textile mill. The seventeen years of exposure during that most crucial period between 1933 and 1950 would appear to have been substantially underestimated. This study, in spite of its less than adequate scientific base is important because it was the first attempt after 1938 to set numerical guidelines for the prevention of asbestosis. The number of persons in the study is very small; the criteria for disease, especially basal rales, not universally accepted; and the estimate of dustiness seriously lacking in rigor. The estimate of dustiness was on the low side for the reasons that I have already mentioned and, in addition, because no attempt was made to further

adjust for the longer working hours and hence of exposure during the war and earlier years. In spite of all of this, the study is a first approximation to a solution of a problem for which there were essentially no other available data in 1968 upon which to attempt a dose-risk estimate. It is my understanding that the enforcement agency of Great Britain looks upon these standards as guidelines and not as rigid requirements for all circumstances in which asbestos is used. Thus, they recognize the incomplete nature of the data used in developing the numbers.

The lowering of the 1938 standard from 5, to 2 mp/ft^3 and 12 fibers per cc, adopted by the ACGIH in 1968 appears to have been based in part upon the data underlying the British proposal and also upon the fact that there was a growing awareness that the old standard of 1938 was not universally effective. The further lowering to 5 fibers/cc was not based upon new scientific data, but appeared to have been made to establish a margin or "factor of safety". In a personal communication from Dr. Herbert Stockinger, Head of the Division of Laboratory and Criteria Development of the National Institute of Occupational Safety and Health and Chairman of the Committee on Threshold Limit Values of the American Conference of Government Industrial Hygienist, I am informed that four months ago, in November of 1971, the Committee of the ACGIH reviewed the standard of 5 fibers/cc and found no evidence to indicate that it should be changed. There are several relatively current studies which support this decision.

I would now like to discuss five of these supporting studies. Murphy et al, in December of 1971 published data on workers exposed

over a period of approximately thirty-five years as pipe coverers in new ship construction. The authors demonstrate that no evidence of asbestosis was found until at least 60 million particles per cubic foot years of exposure had been exceeded. This would indicate that for a forty year period of employment, 1.5 million particles per cubic foot would be the value below which no asbestosis occurred. The report indicated that the actual occurrence of asbestosis was restricted almost solely to those exposed to more than 75 million particles per cubic foot years, which would be close to a value of 2.0 million particles per cubic foot for those employed for forty years. Utilizing a conservative number to convert particles to fibers per cc, one arrives at a level of 5 fibers or more as being that below which no asbestosis was observed. If one utilizes their konimeter data, one can, by suitable calculations, estimate that the average exposure for these workmen was in the neighborhood of 8 fibers per cc, and this too would suggest that a number of 5 or more fibers per cc would have been the level below which no evidence of asbestosis developed. This study indicates, not only that the old standard of 5 mp/ft^3 is unsafe but also that a standard of 5 fibers/cc will prevent asbestosis in employees working for forty years or more.

An extensive and detailed study of a population comprising thousands of workers in the mining and milling of chrysotile in eastern Canada conducted over the past few years by Dr. Corbett McDonald and his associates is of great importance in our considerations because this study has dust counts going back many years and chest roentgenograms available from approximately 1935 to date.

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Dr. McDonald will report on these studies at these hearings. It is my understanding that these studies support the conclusion that those individuals exposed in these occupations for forty or more years would have to be exposed to higher than 6 fibers/cc in order to reveal any evidences of asbestosis.

Becklake and her co-workers, utilizing a segment of the population from McDonald's larger study, have demonstrated that in those individuals who have been employed for long periods of time in the mining and milling of chrysotile asbestos and who do not even show evidence of x-ray changes, the accumulated exposure must have been more than 110 mp/ft^3 years before the most sophisticated techniques can detect evidence of those physiologic changes thought to develop in response to inhalation of asbestos. These data suggest that something larger than 2.5 million particles per cubic foot over a forty year period can be tolerated without even the most subtle manifestations of asbestos exposure. This number would translate into something between five and 10 fibers per cubic centimeter.

In the fall of 1971 at the Fourth International Congress on Pneumoconiosis, held in Bucharest, Dr. McDonald updated his previously reported large study and reaffirmed that an excess of bronchogenic cancer did not occur in the workers in mining and milling of chrysotile asbestos until an exposure equivalent to 200 million particles per cubic foot years was exceeded. This is equivalent to 5 million particles per cubic foot for forty years. It indicates that in the mining and milling of chrysotile an excess of bronchogenic cancer would not be demonstrable in those individuals who were exposed to less than 5 million

particles per cubic foot. This is equivalent to 10 or more fibers per cc. This most important finding supports the view held by Stewart and others that an excess of bronchogenic cancer occurs only in those who have manifestations of asbestosis and that the standard adequate to protect against bronchogenic cancer is a larger number than that required to protect against asbestosis.

Recently, Enterline and his co-workers have reported the results of a study of retirees employed in various asbestos-using manufacturing processes including textiles and where the exposure was different from that in mining and milling because of the inclusion of exposure to crocidolite and amosite as well as other agents which might co-exist. This study shows, and I quote "there appeared to be no direct relationship between asbestos dust exposure and respiratory cancer below 125 million particles per cubic foot years. Important increments in respiratory cancer mortality apparently occurred somewhere between 100 and 200 million particles per cubic foot years' exposure". This would indicate that exposure to 3 million particles per cubic foot would be tolerated for a forty year period without a risk of excess bronchogenic cancer in these types of occupations. Using the conversion factor suggested by Lynch et al, this is equivalent to 18 fibers/cc.

This series of studies indicates that a lower standard is required to protect against pulmonary fibrosis or asbestosis than to protect against bronchogenic cancer. These five studies offer strong support for the position taken by the American Conference of Governmental Industrial Hygienists that there is no need to lower the standard below 5 fibers/cc in order to protect against pulmonary fibrosis or bronchogenic cancer.

In my judgement, we have no specific information of a suitable scientific nature expressing the dose-risk relationship for mesothelioma. Isolated case reports of mesothelioma are of no value in establishing a dose-risk relationship. Equally useless for this purpose are the data offered in studies of insulation workers, asbestos miners and millers, workers in asbestos using manufacturing, domestic exposures and neighborhood exposures. Not a single one of these studies offers data comparing variable exposures to the incidence of mesothelioma and they are therefore of no use for establishing a safe level of asbestos in the occupational environment. These studies do indicate that in some circumstances the risk is present but none speak to the question of the safe level on scientifically acceptable grounds. Nevertheless, these studies of larger numbers of cases of mesothelioma suggest that, in some circumstances the exposure to asbestos which may be related to the development of mesothelioma might be less than that required to produce asbestosis or an excess of bronchogenic cancer. One factor, which has been demonstrated with respect to the relationship between mesothelioma and inhalation of asbestos is of the utmost importance. In all of those circumstances where a strong relationship between mesothelioma and the inhalation of asbestos is suspected, two varieties of asbestos, namely crocidolite and amosite, invariably have been implicated either alone or combined. This is the case in the excess occurrence of mesothelioma among crocidolite miners, asbestos using insulation workers, workers in asbestos textile and insulation manufacturing and in a large multiproduct asbestos using manufacturing plant in the USA. In most of these circum-

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stances there has been a mixed exposure and chrysotile has also been present. In striking contrast, however, when exposure has been solely to chrysotile, as in mining and milling of chrysotile, the frequency of occurrence of mesothelioma has either not been increased or increased only to the very slightest degree. The virtual absence of an excess of mesothelioma in populations exposed solely to chrysotile has been reported by Gilson, Vigliani, Wagner and McDonald on the basis of separate studies. With respect to anthophylite, no excess of mesothelioma has ever been reported. On the basis of information currently in hand, therefore, mesothelioma appears to be predominently linked with exposures to crocidolite or amosite but the dose relationships are unknown.

The studies referred to thus far are the only ones ~~that~~ I am aware of which in my judgement have a meaningful bearing on the setting of a standard for control of asbestos exposure. Other data does exist but in my judgement it does not conform to those criteria, universally agreed upon, for a sound scientific basis upon which to predicate a safe standard.

There is an abundant other body of data which indicates that the prolonged inhalation of asbestos fibers above some level is hazardous, that the biological effect is dose related but that many of the workers exposed for a lifetime never do develop asbestos related disease. This data indicates clearly that past exposures in some occupations, as for example the mining and milling of chrysotile were far less hazardous than exposures in asbestos textile manufacture or the insulation workers'trade and possibly in other occupations as well. The reasons for these differences are

not entirely resolved at this time. Until recently the insulation trade used much more amosite than chrysotile and in some work, especially in England, large amounts of crocidolite have been used. There are coexisting agents in the insulation trade which are not present in mining and milling of chrysotile. The peak exposures appear to be much higher in the insulation trades than in mining, milling or manufacturing. Peak exposures may be much more hazardous than lower levels of prolonged exposure. Fiber counts in the insulation trade in shipbuilding in Great Britain and in construction in Finland ranged from twenty to hundreds of fibers/cc depending upon the kind of work being done. Fiber counts in the construction industry in this country currently indicate somewhat lower TWA levels but intermittent high peaks of exposure. For example, during the mixing of asbestos cement, dust counts commonly as high as 75 fibers/cc during a 5 to 10 minute period are reached as often as 5 times or more a day. Unfortunately, there are no data in the insulation worker trade that compare degrees of exposure over a period of many years to the biological manifestations of excess disease. Until this is available, there is no way of utilizing data from these trades to establish a standard for the control of asbestos inhalation.

There is every indication that the levels of exposure should be lowered, especially the peak levels, but whether or not a lower TWA standard is needed in the insulation trade than in the other trades remains unsettled. There is substantial reason to believe that crocidolite and amosite should be controlled more stringently than is chrysotile. There is also reason to believe that the geometric conformation of the fibers in the mining and milling of

chrysotile may be different from those fibers generated subsequently in manufacture and use of asbestos. Moreover, the fibers of crocidolite and amosite even in mining have a different geometric configuration, as actually observed by Timbrell in airborne specimens, from that of some forms of chrysotile. For these reasons the pulmonary retention of chrysotile may be substantially less than for other varieties of asbestos or for the kinds of fibers generated in other occupations than mining and milling. Animal experiments have demonstrated this to be true.

On the basis of data now available and adequate for the purpose, I wish to indicate that in my judgement a standard of five fibers/cc TWA with peaks not to exceed 10 fibers/cc, such as recommended by OSHA in its present standard and by the ACGIH constitutes a level which will protect against the development of asbestosis and bronchogenic cancer and includes a safety factor since it is a level substantially below that which has been demonstrated to be associated unequivocally with an excess of these two abnormalities. There is evidence relating crocidolite and possibly amosite to excess mesothelioma which suggest that a more rigorous control of amosite or crocidolite would be justified. For this reason it may be rational to have different standards covering different occupations depending upon the variety of asbestos used.

Since I am in disagreement with the recommendation of the Criteria Document that two fibers/cc be established as the safe level of occupational airborne asbestos, it is incumbent upon me to indicate the important points of my disagreement.

In my opinion it is incumbent upon the authors of the Criteria Document to present evidence, which will meet the requirements for scientific validity, in support of their proposal to change the standard and to establish a new one. In the entire document I do not find reference to a single study containing data which will, on the one hand meet the criteria of scientific validity for setting standards and, on the other, support the need to change the standard from 5 fibers/cc or to set it at 2 fibers/cc. In fact, the Criteria Document explicitly says on page 10 of section 5 "The number of studies that have collected both environmental and medical data and with a significant number of exposed workers, is not sufficient to establish a meaningful standard based upon firm scientific data". In other words, the authors of the Criteria Document do not provide any scientific data upon which to base their proposal to change the standard from 5 to 2 fibers/cc or to support the choice of a standard of 2 fibers/cc. The failure to provide this support, in my judgement casts the most serious doubts upon the validity of the proposals.

I am in complete disagreement with the Criteria Document with respect to its expressed opinion that the data relating exposure to biological reaction is inadequate to establish a meaningful standard at this time. While the evidence may not be as far reaching as we would like, it is scientifically valid and adequate to support as a first approximation the opinion that the present standard, established by OSHA several months ago at 5 fibers/cc TWA and peaks not to exceed 10 fibers/cc should not be lowered but left as it is. I have cited the studies supporting this opinion.

Lacking dose-risk relationship data adequate to support the proposal of 2 fibers/cc, the Criteria Document appears to promote an aura of extreme toxicity of asbestos fibers in order to justify the new level. This is done chiefly by citing isolated case reports. In my judgement an inordinate amount of weight is given to isolated case reports which, though of interest and some importance, have no possible utility in setting a numerical standard. Their use in the Criteria Document is doubly difficult to accept in view of the fact that on page 24 of Section III there is the following statement "Isolated clinical case reports are difficult to interpret in terms of dose-time response relationship and can only be used to indicate other possible problem areas and to highlight what may prove to be practicable areas for further study".

An attempt to convey the implication of extreme toxicity of asbestos is again made on page 7 of Section 3 by reference to a study of 232 former employees in a plant that manufactured insulation. This study, by Selikoff, is quoted as revealing four employees who developed x-ray evidence of asbestosis after only one day of exposure to asbestos. Observation of a control group for comparison to those who had been exposed, is totally absent from the Tables for this study that are shown in the Criteria Document. Murphy's study of pipe-coverers, referred to earlier in this statement, demonstrates beyond doubt that in any adult population not exposed occupationally to asbestos there will be some individuals with x-ray shadows that could be interpreted as evidence of slight asbestosis. In the absence of suitable controls, Selikoff's study cannot, on scientific grounds, be interpreted to prove that one day of exposure to asbestos causes

asbestosis. To do so on the basis of the data shown is epidemiologically unsound and to cite this study as evidence of extreme toxicity of asbestos is completely unwarranted.

The manner in which reports and data of different investigators throughout the world are utilized and criticized does not appear to be uniform in this document. For example, the comprehensive review of the epidemiology of asbestos related cancers by Wagner et al, published in 1971 is not referred to. The report by McDonald et al of an extensive epidemiologic study relating dose to risk in 11,788 workers employed in the Quebec chrysotile asbestos mining industry is not discussed in the Criteria Document. This study, published in June, 1971 is the single most detailed and complete study in the world's literature of the dose-risk relationship of one kind of population exposed to airborne asbestos. The only reference made in the Criteria Document to this study, pages 18 and 20 of Section 3, is a criticism of a "progress report" given by McDonald at the Bucharest meeting in September of 1971. One would think that a study of this magnitude would require discussion in a document intended to be a fully developed presentation of the evidence supporting recommendations of such great importance.

It is difficult to understand why McDonald's report is criticized, as stated at the top of page 20 of Section 3, because of the conversion of numbers of particles to numbers of fibers. Particles are converted to fibers by the British Occupational Hygiene Society in developing their standard and at no place in the Criteria Document, pertaining to the British recommendation, does one see a questioning of that procedure. If it is acceptable in the one circumstance it should be acceptable in the other.

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It is even more difficult to understand the criticism expressed in the last sentence of the 1st paragraph on page 20 of Section 3 to the effect that the McDonald study lacks the evidence necessary to make general comparisons with the data of other reported work. The published paper by McDonalds' group contains the complete biological data and the required exposure data expressed in mp/ft^3. This is substantially more data than that furnished by others since it relates exposure to biological effect in the same population whereas other studies such as those of insulation workers do not in any way provide this co-related data. The index of dustiness used in the McDonald report is the same as in those of Murphy et al, Decoufle-Enterline and Williams, all of which are quoted in this document. The criticism that McDonald did not indicate the details of the method used for converting particles/ft^3 to fibers/cc could easily have been answered by a letter or a telephone call, if the authors of the Criteria Document had been desirous of making the comparisons.

Much weight is given to an unpublished paper by Williams, et al from the Pennsylvania Department of Health. One wonders why, in such an important document as the NIOSH Criteria Package, the crude data of the Williams' study was not shown in the tables of the Criteria Document. The way in which the sixty-four cases of asbestos referred to were related to what was undoubtedly a variable exposure is not shown. It is very probable that all of these 64 cases occurre in those who were most highly exposed, very possibly in the neighborhood of five million or more particles per cubic foot. The failure to handle such data in the conventional dose-risk relationship is a serious error.

Inordinate and unwarranted attention is given to contemporary dust counts. The impression is given that these present day counts represent the conditions that existed over the past 40 years. While this may not be intended, more care should have been taken to indicate that the counts were substantially higher in the past, especially in manufacturing places where effort toward controlling exposures by exhaust ventilation, etc. has been expended in the past 30 years. In addition, the reduction of the amount of asbestos contained in manufactured materials has further reduced the exposures, particularly in asbestos insulation workers.

Most of the counts in the tables of this document are expressed as averages, as for example, Tables 13 and 14 pertaining to exposures of insulation workers. This is an inadequate way to display data, since it can give misleading information by masking high exposures if there are a large number of low exposures to dilute the high ones. Biological effects are much more likely to occur in those persons heavily exposed than in those with low exposure, thus, averages of all exposures have little meaning or use in determining the dose-risk relationship.

It is not possible to evaluate fully the exposures from the data shown in some of the Tables of this document. For this we need to know not only the TWA's but also the peaks, the number of observations and the conditions of the environment during the time of sampling. This criticism is especially pertinent to the exposures of insulation workers shown in Table 14. The insulation worker experiences great variability with respect to job conditions, to a large degree dictated by the volume of the space in which he works and by natural ventilation as well as the kind of work he is doing

at the time. Dust counts under all sorts of conditions, and peak as well as TWA exposures must be measured before the insulation worker's exposure can be portrayed. With respect to Table 14, it is surprising that the job of "cement mixing", notoriously characterized by peaks of exposure as high as 75 fibers/cc for periods of 5 to 10 minutes several times a day, is omitted.

The summary, on page 16 of Section 5, describing the basis for the new standard recommended by the Criteria Document is confusing and inconsistent. I quote from the second paragraph, "evidence indicates that past and current standards for fiber concentrations in the working places where asbestos fibers occur, though undoubtedly contributing to reduction of the severity and frequency of asbestosis, have not provided complete protection from exposure to asbestos, necessitating development of a new standard". There is evidence that asbestosis developed under some circumstances, in places thought to have an average exposure of five million particles per cubic foot, or in modern parlance, thirty fibers/cc. This was the standard set in 1938. The ACGIH created a new lower standard in 1968 and another still lower, introducing a safety factor in 1970. The British Occupational Hygiene Society suggested numbers that might serve as a standard in 1968. The current standard in the USA set by OSHA is five fibers/cc, and was set only a few months ago. If there is to be a new standard it will be one set since a few months ago, or at most, set since three years ago. The statement in the Criteria Document, to which I have just referred, indicates that the authors have evidence that the standard recommended by ACGIH in 1968 has been inadequate and has not provided complete protection and hence a new standard is needed. The authors of the Criteria Document

should be required to give that evidence and it is obvious that they have not. Could it be that they are referring to the fact that the standard set in 1938 is inadequate and that a better standard is needed? If so, a lower standard was provided in 1968 and still lower in 1970, and it is this standard which was promulgated as an "emergency standard" by OSHA. It is this OSHA standard for which I believe there is substantial factual evidence of a supportive nature.

An even more serious inconsistency is demonstrated on page 16 of Section 5. Close examination of Items a, b, c, and d reveals in unequivocal terms, that in the judgement of the authors of the Criteria Document there are no scientifically usable data on which to base a standard. Nevertheless, without such data they decide that the current standard must be changed and moreover recommend precisely what the new one should be. There is a strong inference from the second paragraph of page 17, Section 5 that one and perhaps the chief reason for setting the recommended standard at two fibers/cc is that the British have recommended such a standard. I disagree with the concept, if actually intended, that this represents a scientifically valid reason for recommending such a standard. Moreover, it is my understanding that the British did not set a standard in the same sense that it is intended to be used under the new Occupational Safety and Health Act. The British standard is a series of numbers proposed to furnish a guideline with a wide range of personal judgement on the part of their inspectors as to the need for corrective measures when these numbers are exceeded. Under our act it is my interpretation that a standard is to be set which, if not complied with, places the operator under certain penalties. To my mind the two conditions are utterly different.

SUMMARY

In this statement I have described the kind of data required for characterizing the dose-risk relationship in such a manner, that it can be used for setting an occupational standard for airborne asbestos on a scientific rather than an arbitrary basis. Because of the difficulties described, much of the data now extant, concerning asbestos associated disease, is of no use for setting a standard. Isolated case reports and data giving exposures or biological effects without relating the two in the same population are examples of this kind of unusable information. Unfortunately, much of the data now available is competent only to say that asbestos is more or is less hazardous in different groups and that the exposure is varied. Nevertheless, although not numerous, there are specific data competent to speak to dose-risk relationship and these can be used for our purpose. I have cited these.

I have indicated the reasons for my opinion that the Criteria Document has failed to do that which is incumbent upon it, namely, to provide sound scientific evidence to support their request for a change from the OSHA emergency standard and for a new standard of 2 fibers/cc TWA and peaks not to exceed 10 fibers/cc.

I disagree with the view of the Criteria Document that there are no scientifically obtained data adequate for the purpose of setting a standard. I have cited the studies which I believe are scientifically valid and adequate for setting a first approximation to a standard or safe level of airborne asbestos in occupational environments. In my opinion, these studies fully support the

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current OSHA temporary standard of 5 fibers/cc TWA with peaks not to exceed 10 fibers/cc and the recent decision of the ACGIH that there is no need to change from this standard. It should be emphasized that prior to 1940 and for some years thereafter, when many of those persons now developing disease were actually being exposed, the dust counts in mining, milling and manufacturing commonly were in the range of 10 to 100 mp/ft^3. This was most likely equivalent to 30 to 600 fibers/cc. There is no evidence that exposures during that period for insulation workers was substantially lower and, on the basis of British and Finnish data, it was in that range. It is clear then, that the current OSHA temporary standard represents a tremendous reduction from the dust levels of previous years and, in my opinion, includes a substantial safety factor. I believe this level will protect workers, using asbestos over a forty year or more span of employment, from developing asbestosis or experiencing an excess of bronchogenic cancer. If crocidolite and perhaps amosite are more stringently controlled, the liability of experiencing mesothelioma will be markedly reduced and probably abolished.

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STATEMENT OF HENRY B. MORENO
SENIOR OPERATING VICE PRESIDENT
OF JOHNS-MANVILLE CORPORATION
BEFORE THE U. S. DEPARTMENT OF LABOR
HEARING ON PROPOSED OCCUPATIONAL
ASBESTOS STANDARDS
WASHINGTON, D. C.
MARCH 16, 1972

My name is Henry B. Moreno, and I am the Senior Operating Vice President of Johns-Manville responsible for the Company's Industrial and International Divisions.

I am a graduate of the University of Southern California, with a Bachelor's Degree in Electrical Engineering and postgraduate work both at that institution and at the Harvard Business School. For the past twenty-two years, I have held various sales, marketing, production, general management and senior management positions with Johns-Manville.

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As our testimony thus far has indicated, we support the present emergency standards if they are modified as suggested by my Johns-Manville associates here today.

I would like to address my remarks primarily to the engineering problems involved and the economic impact of implementing the standards. I will do this by relating personal experiences and by presenting other information that we have developed for this hearing.

Five years ago, I was given responsibility for our Packings and Friction Materials Division. This is the division in our Company which has many of the asbestos handling problems, especially in its asbestos textiles and friction material operations.

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During those five years and right up to the present time, I have devoted a great portion of my time personally to improving in-plant environmental conditions for our employees, particularly those working with asbestos fiber. For the last four years, our goal has been to bring all of our operations to a Threshold Limit Value of five to six fibers per cc, which is half of the previous TLV standard of twelve fibers per cc.

Since we at Johns-Manville began our active dust control program many years ago, to the best of my knowledge we have, in all modesty, moved far ahead of most other asbestos users in solving environmental problems. Perhaps a specific example will help give some insight to our activities.

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One of our largest plants is located in Manville, New Jersey. It is a multi-product plant containing, among other things, a fairly extensive, integrated textile operation.

I first visited the Manville Plant in 1949. Even though we were unaware of specific health hazards, I can remember the high visability of dust which clouded the ambient air inside the textile building. The personal sampler method of measuring dust was not available then, but certainly—if we could have measured them by that method—we would have determined that the counts around some equipment were over one hundred fibers per cc.

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The next time I saw the operation was several years later during the 1960's. By that time, great improvements had taken place as a result of the studies and developments Mr. Jobe discussed in his testimony. Extensive dust collecting systems were operating, and the plant was using much cleaner asbestos fiber now available because of improved equipment at the mines in Canada.

When I assumed responsibility for the Packings and Friction Materials Division late 1967, the Manville textile operation was included. Maximum dust counts were about thirty fibers per cc. When we embarked upon our program to reduce all counts to five to six fibers per cc, it soon became apparent that we had reached the practical limit of improving the system

by collecting dust and other similar mechanical means. A complete redesign of process and equipment was mandatory. We assembled a team of the best experts available within our Company and talked to manufacturers in both the United States and Europe to determine if improved asbestos textile machinery was available that would perform within the dust levels we had specified. After several months, it was determined that if improved equipment were to be made available, we would have to design it ourselves. This we proceeded to do, and after a three year concentrated program, we have completed the installation of specially designed equipment and processes which in many cases are substantially different from what we had before and the methods currently being used by other asbestos textile producers.

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Even though our operating costs have risen over fifty percent due to our stringent operating procedures, we are quite pleased with the results. One can now look down the full length of the approximately 900 foot building through nearly crystal clear air. This is a dramatic improvement from the appearance three years ago and fantastic considering the operation as I first viewed it in the late forties. Our dust counts are now all below five fibers per cc. Note I said five, not two, fibers per cc. If we are required to operate at the two fibers per cc level, I can see no other solution for us but to shut down some equipment. Having brought the counts from one hundred to below five fibers per cc has been a major accomplishment, particularly when

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one considers that medical results that concern us all were incurred under the former more dusty operating conditions and not under our current modern methods.

I have selected the textile operation for my comments today because that is one which required a great portion of my personal effort and is typical of our Corporate program. We are working on all of our other product lines as well. Asbestos is used in a wide variety of applications, each requiring specific process and equipment design. We could cite instances involving friction materials which pose as complex a problem as the textile operation did. In operations where equipment redesign is not sufficient to reduce

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dust counts to an acceptable level, complete and sometimes radical changes must be employed. These changes most often alter the finished product substantially. When the properties of a high performance friction material are changed for instance, extensive testing in laboratories and in the field must be conducted in order to be certain that the product will perform as required under all conditions, as a failure might cost hundreds of lives. Can you imagine, for instance, a one hundred car freight train operating with unproven brake linings? Or a water pipe that has exploded because of inadequate fiber reinforcement? In some cases, material tests and validations require as much as four to five years. It is obvious then that protecting our environment is a constant and evolutionary process, not one

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which could be sanely implemented by abrupt and severe legislation.

What is the current status of our dust control program? In spite of our know-how and our concerted effort and a capital expenditure outlay of some twenty million dollars, I must say to you that twenty percent of our sampled dust stations company-wide are still operating over five fibers per cc. More importantly, because we have been unable to reach our desired goal for dust control in a number of our operations, we have discontinued the production of over five million dollars worth of asbestos-containing products annually and have thus had to put over three hundred workers into the unemployed ranks.

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As I said before, all of our work has been directed toward attaining a TLV of five to six fibers per cc because our experience and medical advice indicates that this is the most practical approach to providing a safe environmental atmosphere for our workers.

To do this requires extensive engineering. For this reason — to reach a TLV of five fibers per cc actually means designing equipment which will operate at about a three fiber per cc level because we must allow for measurement inaccuracies, human error, maintenance, and climatic variations.

The cost of redesigning and building equipment to operate at lower dust levels increases exponentially— not in a linear fashion. If the TLV were to be set

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at two fibers per cc, it would require capital expenditures of twelve million dollars and additional operating costs of five million dollars per year to bring our operations to the two fiber per cc level, assuming we could develop the capability to do so.

At the present time, approximately half of our present dust stations show consistent readings over two fibers per cc. Included in this group are five manufacturing plants, involving approximately eleven hundred workers. As we see it now, it would not be economically feasible for Johns-Manville to attempt to operate these plants at a standard of two fibers per cc. We estimate that eleven hundred workers would be out of jobs at those locations. And when you add supporting sales, clerical,

research and administrative personnel, we're talking about a total of some sixteen hundred employees who would have to join the unemployed.

Since Johns-Manville is quite typical of thousands of other asbestos product manufacturers and users in the United States—except that many of them have not yet begun to implement dust control programs—it is obvious that the overall effect of lowering the present Threshold Limit to two fibers per cc would have a very substantial effect on our nation's economy.

I would ask this question: "Where will our customers obtain these materials that we no longer produce?"

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In the case of the products we have phased out so far, there have been two sources; one, other manufacturers in the United States—whom I've indicated have about the same dust counts now that Johns-Manville did before our dust control program began—and two, foreign producers. Presently, there are substantial and increasing quantities of fabricated asbestos materials being imported into the U. S. from Japan, Taiwan and South America. Some of our own surplus equipment has been sold to a company in India, so we presume that India and possibly other Asian countries will increase their production and sale of asbestos materials to our country as it becomes more uneconomical to make these products inside the United States.

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Attempting to achieve a standard of two fibers per cc will cost American industry millions of dollars in increased operation costs and, unfortunately, cause a significant number of jobs to be shifted to foreign workers for whom, in many areas, no environmental standards whatsoever will apply.

The present emergency standards—with modifications—provide a good margin of safety and, based on our experience, are attainable in most manufacturing operations if the producers are given a reasonable time to design and install the necessary equipment and implement process changes.

The establishment of a more stringent standard and the requirement of unnecessarily frightening labels,

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as commented on by Dr. Pundsack, would merely cause mass confusion and perhaps irreparable harm to many very reputable companies. In addition, it would have catastrophic effects on the very people OSHA and American industry are attempting to protect. And, unfortunately, would not solve the total human environmental problems because we would simply be shifting the problem to other workers in the world, solely because of unrealistic and unnecessary regulations.

In conclusion, I want to say this quite directly— with no scientifically credible evidence to prove the need for such a low TLV standard of two fibers per cc, it would be nothing less than complete social irresponsibility to adopt it.

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We believe the Department of Labor must establish standards that are practical and realistic.

On behalf of myself and my associates, thank you for permitting us to testify today.

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Johns-Manville

Research & Engineering Center

P.O. Box 159
Manville, N.J. 08835
(201) 722-9000

bcc: J. B. Jobe, G[illegible]-G/[illegible]
A. B. Marchant, G[illegible]-G/[illegible]
F. J. Solon, G[illegible]-G/[illegible]

January 4, 1972

Dr. Irving J. Selikoff
Mount Sinai Hospital
School of Medicine - Environmental Sciences Lab.
100th Street & 5th Avenue
New York, NY 10029

Dear Irving:

This will confirm our telephone conversation last week concerning estimates of the dust levels in various departments in the Manville Plant during the periods 1940 through 1960 and 1961 through 1970. We have made arrangements to estimate these dust levels, and we will furnish you our estimates as soon as they are completed.

In order to make our estimates as meaningful as possible, we would welcome Duncan Holaday's participation in our program of estimation, and I would expect that he would have some constructive suggestions to offer us. If you can make Duncan available for this purpose, our people would like to meet with him at the Manville Plant next week or as soon thereafter as possible. Mr. Hugh Jackson, Director of Employee Relations and Management Development, is coordinating our program of estimating historical dust levels at Manville, and I suggest that you have Duncan contact him directly. Mr. Jackson is located in our New York offices, 22 East 40th Street, telephone 532-7600, Extension 333. If Duncan has any trouble reaching Mr. Jackson, then he should of course call me.

I appreciate your offer to send us the Union's estimate of dust levels at the same stations in the Manville Plant, and we will want to see their estimates later. However, as I mentioned to you last week, I believe it would be very informative for all of us if we made our estimates before we see the estimates of the Union.

Sincerely yours,

Fred

F. L. Pundsack
Vice President, Research & Development

cc: H. M. Jackson

AL-1

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Research & Engineering Center

P. O. Box 159
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March 24, 1972

Mr. Arthur Goldberg
Hearing Examiner
U.S. Department of Labor
OSHA Hearings
Room 305-306
Railway Labor Building
400 First Street, NW
Washington, DC 20001

Dear Mr. Goldberg:

Enclosed is a list of "locked-in" and "non-locked-in" asbestos-containing products for incorporation into the record of the OSHA hearings on occupational standards for asbestos dust which were held March 14-17, 1972 in Washington, DC.

As you recall, in my testimony with regard to some of the proposed labeling requirements for asbestos-containing products I argued that no labels should be required for products in which the asbestos is "locked-in-place" by a binder such as portland cement, resins and plastics. On the other hand, I did support the use of proper cautionary labels on products in which the asbestos is not firmly locked-in-place, and in which the worker who handles and applies the material may generate significant quantities of asbestos-containing dust. During the questioning which followed my testimony, I agreed to submit a list of "locked-in" and "non-locked-in" products which could be incorporated into the hearings. These are the lists which are attached.

We have used the following general definition for "locked-in" products:

> "Locked-in" asbestos-containing products are those products in which the asbestos is firmly fixed in place with some type of binder, saturant, coating or bonding agent such that normal handling and application does not generate significant quantities of asbestos-containing dust.

Examples of binders, saturants and coatings used in "locked-in" products are portland cement, phenolic, polyester, epoxy and other thermosetting resins, thermoplastic resins, asphalt, bituminous concretes, and latex and similar polymeric coatings or bonding agents.

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Although we have tried to make the enclosed lists of products as complete as we can, it is possible we have overlooked some uses. Thus, if OSHA accepts and uses the distinction between locked-in and non-locked-in products, a provision should be made for adding products to the lists in the future.

It should be understood that the range of asbestos contents listed for the products is an approximate range. We believe these ranges to encompass most formulations, but it is possible that a given manufacturer may be operating either slightly higher or lower in asbestos content than these ranges.

Thank you for the opportunity to submit this material for the record.

Very truly yours,

F. L. Pundsack
Vice President, Research & Development

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Enc

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Research & Engineering Center

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Manville, N. J. 08835
(201) 722-9000

Mr. A. Goldberg
March 24, 1972
Attachment 1 -Page 2
"LOCKED-IN" ASBESTOS PRODUCTS

PRODUCT	APPROXIMATE RANGE OF ASBESTOS CONTENTS IN PRODUCTS AS USED
FRICTION MATERIALS	
Brake linings	35 - 70%
Clutch facings	35 - 60%
Heavy duty brake linings	70 - 75%
PACKINGS & GASKETS	
Braided textiles (resin saturated)	50 - 60%
Millboard (polymeric bonded or encapsulated)	85 - 95%
Packings - sheeter type	80 - 85%
Packings - beater additive type	55 - 80%
PAPERS & FELTS	
Backing for sheet flooring (polymeric bonded)	85 - 88%*
Cooling tower papers (inorganic bonded & coated)	80 - 90%
Electrical papers & tapes (resin saturated)	65 - 75%
Laminating papers (resin bonded)	50 - 65%
Pipe line felts (bitumen saturated)	65 - 70%
Protective metal sheets (metal bonded & enamel coated)	85 - 90%
Roofing felts (bitumen saturated)	60 - 65%
Underlayment felt (polymeric bonded)	85 - 88%
PLASTICS	
Thermoplastics	20 - 40%
Thermosetting	20 - 25%
SEALING COMPOUNDS	
Caulking putties & sealants	15 - 45%
Radiator sealants & coolants	0 - 1%
TILE	
Asphalt tile	15 - 25%
Vinyl tile	10 - 20%
Tile adhesives	3 - 10%

*Excludes varying thicknesses of vinyl surface applied to the backing. The fiber content of the finished flooring product is much lower than these ranges.

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GHO - Denver
January 5, 1972

RESEARCH
ENGINEERING
JAN 7 - 1972
R. L. DIENSBACH

S. Speil - Research & Engineering Center

ASBESTOS FIBER
U.S. AND CANADIAN SHIPMENTS TO THE U.K.
AREA AND EUROPE

Your letter of December 29, 1971 to G.F. Parker has been referred to me.

You inquire as to company policy regarding labeling of asbestos-containing insulation materials manufactured in the United States and shipped to a location outside of North America. Company policy would reflect top level decisions based on combined legal and business advice and recommendations. I have not been informed as to a company policy bearing directly on your question.

The United Kingdom has specific legislation dealing with the problems of asbestos. I have been furnished with a copy of The Asbestos Regulations 1969 which, in turn, is applicable to certain locations subject to the Factories Act 1961. I do not have a copy of the latter statute. To date, no request has been received to have an examination made of U.K. law or of the law of any other foreign country bearing on the subject. In view of the number of countries involved to which asbestos fiber and products containing asbestos fiber are shipped, and in view of the number of legal contexts in which a question might arise, examination in any one or more foreign countries could involve substantial legal expense. Upon receipt of a request to do so, I shall be glad to have investigations made wherever desired.

In addition to specific legislation, questions of general law may well exist under the legal systems obtaining in most of the foreign market areas. This would be true in both common law and civil laws countries. Investigations in these fields would, of course, entail further legal expense.

In view of the above, it has been the position of the Legal Department that appropriate caution labels should be used wherever applicable. Obviously, such a position will

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necessarily involve substantial business questions. I have not been advised recently as to the business position on these questions. However, I note from J.L. Fischer's letter to L. Sorrentino dated December 9, 1971, a copy of which is enclosed with your letter, that D. Poutiatine has advised that the Asbestos Fiber Division has a policy that asbestos fiber shipments to the U.K. area should not contain a warning label. I have not been informed whether such a policy has been established following full advice as to applicable law.

In view of the above, I do not feel in a position to answer your specific question. It is possible for me to note merely that, based upon preliminary legal advice and general principles of law, it is the position of the Legal Department that export shipments should bear appropriate caution labels.

Please advise if I may be of further assistance.

W.P.S. Breese

cc: F.L. Pundsack - Research & Engineering Center
L. Sorrentino - J-M Intl., New York
J.L. Fischer - J-M Intl., New York

[illegible] RESEARCH
[illegible]

JAN [illegible] 1972

F. L. PUNDSACK

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PRIVILEGED

J-M 83

GHQ - Denver
January 13, 1972

J. B. Jobe

LABELING OF ASBESTOS AND ASBESTOS CONTAINING PRODUCTS - EXPORT SALES

We have recently been requested to advise on company policy relative to labeling asbestos containing insulation materials manufactured in the United States and shipped to a foreign location.

I am aware of decisions made in the past that shipments of asbestos and asbestos containing products would not bear caution labels. I do not think those decisions rise to the level of "Company Policy." Regardless, recent developments in asbestos related health problems and legal liabilities make a review of our export labeling practices highly desirable.

A preliminary review of the law of foreign countries to which asbestos is exported and of general principles of foreign law indicates that asbestos and asbestos containing products should bear appropriate warning labels. The Legal Department has consistently recommended such labeling.

I believe it is pertinent here to note that had labels not been adopted on domestic products during 1964, the company's position in currently pending litigation would be all but indefensible. Thus far, fourteen common law asbestosis actions and two common law mesothelioma actions have been instituted in the U. S. against various Johns-Manville corporations. A considerable number of similar actions are anticipated. Those suits basically allege that we owed the plaintiffs a duty to warn of the hazardous nature of asbestos and were negligent in discharging that duty.

My concern is that the development of laws on this subject in foreign countries will parallel our experience in the United States. Labeling in the U. S. and Canada coupled with a failure to label in export shipments would seriously weaken our position in defending litigation which might arise abroad.

A thorough review of the applicable laws of countries to which we export will be time consuming and expensive. I believe such [illegible] I would like to know whether the business responsibilities will be in a position to re-evaluate the exposure inherent in continuing present practices.

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GP

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I recommend that you assemble a group to discuss this question on a preliminary basis and to determine whether detailed studies ought to be undertaken.

G. Earl Parker

cc: D. T. Colton
W. L. Vanderbeek
W. E. Lehman
Paul Nikitovitch
Fred Pundsack
J. R. M. Hutcheson
J. A. McKinney
W. P. S. Breese

PRIVILEGED
J-M 83

GP

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105

supplement 1/31/72

cc: W. Streit
S. Spivak
J. Lewandowski

RECEIVED
JAN 27 1972
F. L. FUNDERBURK

DHQ
New York, N.Y.
January 25th, 1972

G. E. Parker - Denver

Labeling of Asbestos and Asbestos
Containing Products - Export Sales
Your Letter 1-13-72

Please refer to your subject letter to Mr. Jobe.

After consulting Mr. Hutcheson, we believe it is necessary to consider this matter from the point of view of the efforts we are making to sell asbestos fibre in international markets, and for this reason the following observations are appropriate.

1. A great deal of regulations have been issued in Britain regarding the handling of asbestos fibre. In fact, Britain has been ahead of the U.S. in this area. Despite this fact, no labeling of any kind is done in Britain, and all asbestos companies in Britain ask the Canadian industry not to accept such a measure on asbestos shipments to the United Kingdom.

2. We know of no other foreign country where such labeling or the type of litigation referred to in your memo is pending.

3. The seller of our asbestos is Canadian Johns-Manville and we question, therefore, if it is subject to U.S. regulations pertaining to the labeling of products.

4. In view of the vehement resistance to any type of labeling that has been expressed by all of our major customers any decision by J-M to label its fibre for export would only add to our competitive disadvantage unless other Canadian producers agree to do the same.

5. Instead of reevaluating the exposure inherent in continuing the present practices, I recommend that this matter be brought up at the next QAMA meeting and that we solicit again the opinion of our largest customers abroad on the latest opinion and evaluation of J-M's exposure in our relationships with them.

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G. E. Parker - Denver

Under the circumstances we have no alternative but to recommend that labeling of asbestos bags for sales to export markets be postponed indefinitely, at least until such time as our principal customers accept or request it.

D. Pentlatine

cc:
J. B. Jobe
D. T. Colton
M. L. VanDerbeek
M. E. Lehmann
P. Nikitovich
F. Punsack
J.R.M. Hutcheson
J. A. McKinney
M.P.S. Breese

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March 3, 1972

TO ALL WAUKEGAN PLANT EMPLOYEES

ENVIRONMENTAL CONTROL COMMITTEE BULLETIN

Several items discussed at this month's meeting of the joint Union Management Environmental Control Committee were thought to be important enough to bring to the attention of all employees. .

Course on Potential Hazards of Asbestos

Illinois Pollution Control Board Regulation R71-16 passed January 6, 1972 requires that all employees working with asbestos complete a course of instruction on the potential hazards of exposure to asbestos fiber. In this regard, Dr. Sarley has prepared a 15-minute slide and tape presentation which will be shown to all employees sometime during the last two weeks of March. Regular meetings such as monthly department safety meetings will be utilized to give the presentation. It is important that all employees make sure they are present at one of these meetings.

Plant Inspections

The Union members of the committee have designated their representatives to accompany any State or Federal inspector who comes to Waukegan to inspect the Plant and request Union representation. They are:

1st. Alternate	-	Ben Fout
2nd. Alternate	-	Jim Middleton
3rd. Alternate	-	Bill Madison

Wearing of Respirators

The new Federal Occupational Safety & Health Act requires employers to issue respirators to any employee working in areas over Threshhold Limit Value (TLV) of any known toxic substance, and to make sure those employees wear the respirator. Bulletins and "caution" signs are being placed throughout the Plant so everyone knows where these areas over the current TLV are. Every possible effort is being made to reduce these concentrations of dust to below the TLV so that a respirator will no longer be necessary. Until that time, the law states clearly that the protective respirator must be worn.

EVC COMMITTEE

R. Demarest	B. Fout
R. C. Smith	M. Middleton
J. Ritzler	W. Madison

Post 3/3/72 Remove 3/24/72

Removed 3/29/72 From Bill Board

A.F.D. ASBESTOS
March 3rd, 1972

A.W. Hendry

SAFE HANDLING OF ASBESTOS FIBRE

It has been our practice in the past, to package and ship fibre in the most economical manner. We have used 2 ply paper bags, 7-1/2 oz. jute bags and made use of the best possible freight rates available for standard railway equipment.

More recently, pressures created by the new emphasis being placed upon environmental control and health considerations, have forced us to review some of our ideas and give dust control a higher priority than cost. It is apparent to us that asbestos users in the U.S.A. and Canada, as well as in many other countries of the world where similar pressures are being exerted, are quickly becoming conditioned to the idea that dust control is obligatory and will inevitably cost something to achieve.

The conclusion is therefore, that we should not be reluctant because of cost, to investigate and experiment with novel packaging and shipping methods which will satisfy the environmental control standards since, in most cases, the customer will be prepared to pay a (reasonable) price for being provided with a ready-made solution to a difficult problem.

So far we have had some success by introducing pulpable bags for the paper industry, shrink wrap polyethylene shrouds for overseas shipments and so on. However, I would like to see more work done on this programme so that we shall be indisputable leaders in the field of safe handling of asbestos fibre. If achieved, this would, I am sure enable us to increase our share of the market.

I am listing below, one or two ideas on the type of changes which could be made.

1. The more extensive use of special railcars for domestic and plant shipments, for example :-

   a) Bulk tank cars for the asbestos cement and paper industry where the fibre is purged out in water rather than in air.

   b) Compartmentized box cars, which can be loaded and unloaded mechanically 100% and which are leased to J-M to ensure regular return.

   c) Specially constructed cars with built-in ventilation carrying the J-M name and "ASBESTOS THE SAFE WAY" or words to that effect.

/ continued

A1-1

8. The development of special packages.

a) Pure soluble in substances other than water for use in friction materials, vinyl floor tile, etc.

b) Other types of container which can be attached directly to a customer's equipment and discarded or returned when empty. (Like a caulking cartridge for example).

9. Centralized Mixing Stations for small users.

Where there are many relatively small users in an industrial area such as Chicago, set up in conjunction with an asphalt company a central proportioning station where fibre would be mixed into dough consistency for sale to producers of roof coatings, caulks etc. This would restrict the number of accounts with limited resources trying to set up full dust control systems and giving the industry a bad name.

While some of the foregoing ideas may not be new, I sincerely believe that this approach should lead to increased fibre sales.

H.F. MAY

HFM/ab

AL-1

TESTIMONY OF

FRED L. PUNDSACK, Ph. D.,

VICE PRESIDENT, JOHNS-MANVILLE CORPORATION

AT THE PUBLIC HEARING ON

PROPOSED OCCUPATIONAL HEALTH STANDARDS FOR ASBESTOS

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

U. S. DEPARTMENT OF LABOR

WASHINGTON, D. C.

MARCH 16, 1972

My name is Fred L. Pundsack, and I am Vice President for Research and Development for the Johns-Manville Corporation. I have a Ph.D. in Chemistry, and I have been involved with research and development work on asbestos for almost 20 years.

The purpose of my statement is to discuss the several warning label requirements for asbestos and asbestos-containing products which are specified in the various permanent standards for asbestos which have been proposed for consideration by the Occupational Safety and Health Administration.

These hearings have established clearly that the final rule that is promulgated with respect to a permanent occupational standard for asbestos extends far beyond the direct effect on the asbestos industry and the people who work in it.

The Occupational Safety and Health Act places in the hands of government and the administrators of government tremendous opportunities to bring about

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significant social and business changes. But it also places a great responsibility on the shoulders of government administrators to be certain that the changes they bring about are good changes. Perhaps nowhere else in the asbestos standards being considered today is the opportunity to bring about bad changes so clearly evident as it is in some of the proposed label requirements. If these label requirements are adopted in their proposed forms, they will, in our opinion, destroy large segments of the industry and eliminate thousands of jobs. And they will do this without any significant evidence that the proposed types of labels are necessary.

I would like to spend the rest of my testimony pointing out why the proposed labels are unnecessarily destructive to the industry, and to offer a constructive alternative which will accomplish the objectives of protecting the health of the worker and maintaining the useful products and the viability of the asbestos industry.

The purpose of a warning label is to alert the user, in this case the worker, to hazards that may be associated with the handling of the product. In addition, the label should, when it is applicable, indicate the precautionary steps the worker must take to protect himself. The label must accomplish these objectives with simple, easily understood language. In short, the label must alert and instruct, but it need not use frightening and terrifying language to accomplish these ends.

Much of our philosophy of labeling in this country originates with toxic and poisonous chemicals or drugs which may be ingested, or which may be absorbed through the skin, or from which the vapors or fumes may be inhaled. In many cases, these chemicals and drugs are acutely toxic, even in relatively low

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concentrations, and they act rapidly --- often in a matter of minutes or hours. In addition, the chemicals sometimes pose additional hazards because they may have very low flash points and they may be highly flammable or explosive or corrosive.

Asbestos, an inorganic substance which has no vapor pressure, is not explosive, does not burn, and is not absorbed through the skin, does not fit very well into the numerical hazard rating system for these types of properties. Nevertheless, the NIOSH recommendations for an occupational exposure standard for asbestos in "Section 3 - Labeling" of their document recommend a warning label for asbestos which uses the toxicity standards developed in 1954 and reported at that time in an article titled "Safe Handling Procedures for Compounds Developed by the Petro Chemical Industry".

We believe the application of this type of labeling to asbestos is inappropriate. Instead, we recommend that a Caution or Warning label with the following type of text be used on bags or containers of asbestos fiber:

CAUTION

This bag contains chrysotile asbestos fiber.
Inhalation of asbestos in excessive quantities
over long periods of time may be harmful.
If proper dust control cannot be provided,
respirators approved by the U. S. Bureau
of Mines for protection against pneumoconiosis-
producing dusts should be worn.

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I would like to direct your attention now to the Advisory Committee recommendations. The Advisory Committee recommendations on Asbestos Dust Standards go far beyond the labeling recommendations made by NIOSH. The Advisory Committee in "Section (f) - Warning label and sign" Part (1) propos that a warning label be affixed to all raw products, mixtures and finished products containing 5 percent or more by weight of asbestos. The legend proposed for the labels utilizes the terminology "May Cause Asbestosis and Cancer" in large bold type. On the other hand, the label does not really indicate the precautions the worker should take to protect himself.

We believe this proposed label on asbestos-containing products is unnecessarily frightening and alarming, and it would have a very severe and undeserved economic impact on the industry. The proposal to label all asbestos-containing products also ignores the point that in the majority of asbestos-containing products, the asbestos is firmly locked-in-place with cement, resins, or plastics, and in normal handling, application and use no significant amounts of asbestos dust are generated.

For example, in asbestos-cement pipe, which may contain 10 percent to 15 percent asbestos, the asbestos fibers are firmly bound in place with portland cement. Asbestos-cement pipe has been in use in this country for 40 years, and we know of not one single case of asbestos-related disease associated with the installation or use of asbestos-cement pipe. Yet the Advisory Committee recommendation would require that this product carry a label that it "may cause cancer".

I do not believe that it takes very much imagination to envision what will quickly happen to the asbestos-cement pipe industry if this labeling require-

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ment is adopted. The industry will simply cease to exist, and I believe it will cease to exist within 2 to 4 years after the adoption of the labeling requirement I have just discussed. It will cease to exist because the unjustified term "cancer" in the label will frighten and terrify people.

If the asbestos-cement pipe industry should fail, it will mean the closing of more than a dozen manufactureng plants in this country, and it will put thousands of people out of work. In a number of cases, these job losses will occur in communities in which the asbestos-cement pipe plant is one of the largest employers in the community. If asbestos-cement pipe were really hazardous, then I suppose we would have to accept the closing of these plants and the loss of all these jobs as the penalty we must pay for progress in occupational health. But asbestos-cement pipe is not hazardous, so the application of a label to it, as recommended by the Advisory Committee, is analagous to sentencing to death an innocent victim.

I have cited as an example of the labeling problem only asbestos-cement pipe. The same general arguments, however, would apply to products such as asbestos-cement shingles, flat and corrugated asbestos-cement sheets, vinyl-asbestos floor tile, asphalt-saturated roofing felts, etc. We believe, therefore, that in products in which the asbestos is locked-in-place with a firm binder such as portland cement, resins, or plastics, no label is required or should be required. Instruction in good work practices in the handling and application of these materials will provide excellent protection to the workers installing the materials. We strongly urge, therefore, that labeling of locked-in asbestos-containing products not be required.

On the other hand, we support proper caution labels on products in which the

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asbestos is not firmly locked-in-place by cementing binders, and in which the worker who handles and applies the material may generate significant quantities of asbestos-containing dust. Examples of such products would be friable low-density pipe and block insulations and insulating cements. For these kinds of products, we recommend this type of label:

CAUTION

THIS PRODUCT CONTAINS ASBESTOS FIBER.
INHALATION OF ASBESTOS IN EXCESSIVE QUANTITIES
OVER LONG PERIODS OF TIME MAY BE HARMFUL.
DUST MAY BE CREATED WHEN THIS PRODUCT IS HANDLED.
IF PROPER DUST CONTROL CANNOT BE PROVIDED,
RESPIRATORS APPROVED BY THE U. S. BUREAU OF
MINES FOR PROTECTION AGAINST PNEUMOCONIOSIS-
PRODUCING DUSTS SHOULD BE WORN.

We believe this label fulfills the requirements of a good label. It alerts and instructs, but it does not terrify.

I would like to make one last point with regard to labeling. If labeling is required for asbestos-containing products manufactured and sold in the United States, then provision should be made to see that similar products produced abroad and imported into the U. S. bear the same labels. Otherwise, the imports will enjoy an unfair competitive advantage. So far as I am aware, OSHA does not have the authority to regulate these imports.

Thank you for the opportunity to testify at this hearing.

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Φ2ΦD·A
Dust Survey
Φ25DA

CANADIAN ASBESTOS DUST STATIONS OVER TLV
ON MOST RECENT SURVEY
ASBESTOS FIBER DIVISION

ASBESTOS FIBER DIVISION
REEVES - SURVEYED 04/24/72 to 04/29/72

Station No.	Station Description	TLV F/cc	Latest Counts F/c
D1-MiO	Mill Leader - Oper. - Roving	5.0	5.4
D3-SwO	Sweeper Opr. In Mill - Roving	5.0	8.8
D10-PO	Pressure Packer Oper.	5.0	56.0
D11-PP	Between Pressure Packers #1 & #2	5.0	52.0
D13-PAL	On Col. Between Conv. Feeding Palletizing Station, 1st Fl.	5.0	11.0
D14-MF	South of Fiber Refeed Table - 1st Fl.	5.0	5.7
D27-Se	2nd Fl. Col. F-14, Near BS-RLI 1	5.0	50.0
D29-Sn	Between Screens RS11 & 12 at Col. E-7	5.0	9.2
D30-PT	3rd Fl. Paddle Trommel Area Col. B-9	5.0	32.0
D22-SE	Near FS SF 2.1 Separator Col F-14	5.0	15.0
D37-Sn	3rd Fl. Col. E-8 Between RS9	5.0	26.0
D38-Sn	Between Screens FSAS2.1 & 2.2, between Col B-11 & B-12, 3rd Fl.	5.0	12.0
D39-Sn	Between Screens AC2.1 & SPT Fo 2.1 & Col. C-13 & C-14, 3rd Fl.	5.0	15.0
D47-Sn	4th Fl. Col. E-8 near Conv. 15-F & Screen AB1.1	5.0	10.0
D58-RA	Return Air Inlet Col. F-12 5th Fl.	5.0	10.3
D59-Sn	Between Screens RS3 & RS4 at Col. D-8 5th Fl.	5.0	9.2
D67-Col	6th Fl. Col. D-8 Collector AB1.2	5.0	5.7
D68-Col	6th Fl. Col. F-8 Collector AB1.3	5.0	7.1
D69-El	Bucket Elevator BE3 Col. D-7 6th Fl.	5.0	7.1
D15-Cv	Basement of Scalping Plant East of Tailings Conv.	5.0	34.0
D44-Cvt	At Tail End of the Conv. Feeding into the Scalping Plant, 4th Fl.	5.0	50.0+
D45-Cvd	Discharge end of Scalping Plant Feeder Conv. 4th Fl.	5.0	13.0

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CANADIAN ASBESTOS DUST STATIONS OVER TLV
ON MOST RECENT SURVEY
ASBESTOS FIBER DIVISION

ASBESTOS FIBER DIVISION
REEVES (CONTINUED)

Station No.	Station Description	TLV F/cc	Latest Counts F/c
D1-CrO	Crusher and Dryer Oper.	5.0	43.0
D18-Cv	Between Conv. 9 & 10 West of Control Panel	5.0	100.0+
D19-Cv	Between Conv. 9 & 10 Against Conv. 14	5.0	100.0+
D29-Hg	Between Hazemags AP42 and M752	5.0	100.0+
D38-Col	Between Collectors A1.1 & A1.2 3rd Fl.	5.0	100.0+
D39-CC	Control Cabin for Feed to Jaw Crusher	5.0	200.0+
D1-DO	Drill Oper. Primary	5.0	65.0
D2-DO	Drill Oper. Secondary	5.0	8.4
D1-QCD	Quality Control Sampler Oper.	5.0	10.8
B3-ERO	E&R Maintenance Oper. In Mill	5.0	16.0
D4-ERO	E&R Maintenance Oper. in Crusher Room	5.0	5.4
D5-ERO	E&R Electrician	5.0	7.7
D16-QCL	Quality Control Lab.	5.0	5.5

Dusty conditions are worse than those found in the previous survey. Maintenance forces have been curtailed because plant is to be shut down. Because of this situation, additional Industrial Hygiene Surveys would be useless, and therefore, we plan no future visits to Reeves.

CE-1

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L. B. Hermelink - Waukegan
V. J. Liotta - Manville 99

cc: E. M. Fenner
H. M. Jackson
M. A. Tappin
R. Winkworth - Waukegan
J. D. Anderson - Manville

EFFECT OF RESPIRATOR & PROTECTIVE CLOTHING USE ON JOB RATES & INCENTIVE STANDARDS

The Occupational Safety & Health Standards for exposure to asbestos dust, which became effective on 6/7/72, were reviewed by H. M. Jackson, E. M. Fenner, M. A. Tappin, and G. A. Wall on June 16. We are particularly concerned with the economic impact of the dust standards upon job rates and incentive standards of hourly employees, as well as the comparable out-of-pocket costs of using disposable respirators and protective clothing versus reusable respirators and clothing.

The regulations state that wearing of respirators is not to be construed as a permanent means of complying with the standards. Improved engineering controls and work practices are to be adopted where threshhold limit values of 5 fibers per cubic centimeter of air are exceeded. Respirators may be worn: (1) during the time required to install improved engineering controls and work practices; (2) in work situations where these controls and practices are either technically not feasible or feasible to an extent insufficient to meet the standards; and (3) in emergencies.

The Environmental Control Department states that some of the sampling stations at the plants are out of control relative to the 1972 TLV. Also, that within 2 years, the bulk of the out-of-line conditions should be eliminated.

Please make a survey of your location as to the effect of use or nonuse of respirators and protective clothing upon all job rates and wage incentive standards and costs.

I. Identify all job evaluations on which use of a respirator is recorded in the job description or job specification.

A. List all jobs, by departments, on which incumbents do not wear respirators and respirators are not needed. Estimate annual savings of credits for using respirator were eliminated from surrounding factor.

B. List all jobs, by departments, on which incumbents do and should wear respirators, but no credit is allowed in evaluation. Estimate annual increase in cost if credit for wearing respirator were incorporated into

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the evaluation of surroundings.

C. List all jobs, by departments, on which incumbents will be required to wear protective clothing (in addition to respirators). Estimate annual decrease in cost if points allowed for clothing spoilage were reduced.

II. Identify all wage incentive standards, in which the 10% respirator allowance has been included.

A. List all operations, by departments, on which operators do not wear respirators and respirators are not needed. Estimate annual savings if credit for wearing respirator were removed from the standard.

C B. List all operations, by departments, on which operators do and should wear respirators, but no credit is allowed in the standard. Estimate annual increase in cost if credit for wearing respirator were added to the standard.

We suggest that you start in the Residential Products plant, establishing an approach and reporting your findings before starting in the Pipe and Industrial Products plants. We attach Industrial Hygiene Reports, on which all testing stations and most recent testing results are listed.

Mr. Jackson will separately request any cost data which he may need on disposable vs reusable respirators and protective clothing.

C Gab!

G. A. Wall

Note: Manville made a similar study on respirator usage in 1969 which may be useful. Waukegan reviewed probable effect of reducing points for clothing spoilage if protective clothing is required about 6-8 months ago.

G.A.W.

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RJR- MISC
B/4 6/30

INDUSTRIAL PRODUCTS DIVISION, DHQ
June 26, 1972

H.M. Jackson

NEW OSHA REGULATION
CAUTIONLABEL

This will confirm our discussions of last week and our phone conversation of today.

For the moment, we have not labeled any products from the old P&FM line since most products firmly bound the asbestos fibers within the matrix. There are notable exceptions in asbestos textiles.

After your meeting in Washington, you were to advise us which products in the old P&FM line that we must caution label. Obviously, we will not be able to meet the July 7 deadline on labeling these new products unless we are notified immediately of your decision.

We are taking action to revamp all labels in former IID products on which the label was included as part of the carton or package. The caution wordage would be exactly as shown in the OSHA bulletin on June 7.

Regarding product inventory of cartoned and packaged material; we are taking no action until you advise regarding government decision at your meeting in Washington this week.

D.B. WINGERTER

DBW/sjv

cc: R.M. Billings
C.L. Stake
A.W. Jung

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Manville, N. J.
June 27, 1972

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

R. R. Nicodemus
C. G. Bryant
R. L. Lewis
F. Revell

Effect of Respirator & Protective Clothing Use on Job Rates & Incentive Standards

Corporate Industrial Engineering has been requested to estimate the economic impact of the new dust standards, issued by OSHA, upon job rates and incentive standards.

We need to make a survey of the Manville location as to the effect of use or non-use of respirators and protective clothing upon all job rates, wage incentives and costs.

The procedure will be as follows:

1. Identify all job evaluations on which use of a respirator is recorded in the job description or job specification.

   A. List all jobs, by departments, where respirators are no longer worn or needed.

   B. List all jobs, by departments, where respirators should be worn but no credit is allowed in the evaluation. Also note the percent of time worn.

   C. List all jobs, by departments, on which protective clothing will be required.

2. Identify all wage incentive standards in which the 10% respirator allowance has been included.

   A. List all operations, by departments, on which operators no longer wear respirators and respirators are not needed.

   B. List all operations, by departments, on which operators do and should wear respirators, but no credit is allowed in the standard.

U. S. [illegible]
Corporate Industrial
[illegible]

AL1 [illegible]

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Manville, N. J.
June 27, 1972

W. L. Ruff
E. F. Henry
A. W. Sung
H. Pontus
A. B. Lukens

R. R. Nicodemus
C. G. Bryant
R. L. Lewis
F. Revell

Effect of Respirator & Protective Clothing
Use on Job Rates & Incentive Standards

Corporate Industrial Engineering has been requested to estimate the economic impact of the new dust standards, issued by OSHA, upon job rates and incentive standards.

We need to make a survey of the Manville location as to the effect of use or non-use of respirators and protective clothing upon all job rates, wage incentives and costs.

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   A. List all operations, by departments, on which operators no longer wear respirators and respirators are not needed.

   B. List all operations, by departments, on which operators do and should wear respirators, but no credit is allowed in the standard.

W. J. Ridgle
Corporate Industrial
Engineering

AL1-0336 1363

RECEIVED JUL 12 1972 (110)

BOSTON UNIVERSITY MEDICAL CENTER

BOSTON UNIVERSITY SCHOOL OF MEDICINE

80 EAST CONCORD STREET, BOSTON, MASSACHUSETTS 02118

Thoracic Services

JUL 27 1972

July 7, 1972

TO: Dr. Thomas E. Davison
Dr. Ray Huffman
Mr. Clifford L. Shockley
Mr. John F. Mall

FROM: Dr. Edward A. Gaensler

RE: Health Examination, Employees of J.-M. Billerica Plant 1971/72

Enclosed you will find a computer summary including years of J.-M. employment, date, age, and some notations concerning history, physical examination, pulmonary function, x-ray diagnosis and "other significant diseases" concerning 65 individuals that we examined during our survey. Two of these individuals subsequently had additional very extensive arterial blood, alveolar gas and diffusion studies at rest and during exercise.

Concerning x-ray examination, we have reviewed all old films made available and have classified our present films according to the new UICC/Cincinnati classification. The type of infiltration is indicated under p, q, r (there were none), under s, t, u or linear shadows "1" representing very fine shadows, "2" coarser shadows that do not obliterate normal lung markings and "3" very coarse shadows (there were none). Also indicated is a finding of ground-glass densities that we think of great significance. Pleural involvement is indicated as well. The last column "overall severity" is according to the UICC/Cincinnati classification. For example, "22" stands for 2/2.

Our definition of asbestosis: In a letter by Dr. Huffman of 2/16/72 it is stated that "all cases of asbestosis, whether slight, moderate or severe, must be reported to the Federal Government within 48 hours of the diagnosis." This may well be the law. However, our experience indicates that with presently available criteria a diagnosis of "slight asbestosis" cannot be made with any degree of certainty. Indeed, in a shipyard survey that we published in the NEJM in December, 1971 it was shown that a diagnosis of "slight asbestosis" occurred almost as often in a group of unexposed controls than in a group of exposed pipe coverers. We have

Exhibit 24 for ID
WITNESS W. B. Reitze
DATE 3/15/7
JOAN COSGROVE, C.S.R.

JM0311045

therefore limited our diagnosis to moderate (there were 8 such individuals) and severe (there were no such individuals). We base our diagnosis of asbestosis on the following factors: a chest radiograph compatible with a diagnosis of asbestosis of severity 2/1 or greater according to the UICC classification; typical dry rales with a "close-to-the-ear" sound (cellophane rales) heard in two or more places (2+); dyspnea that, according to the Fletcher classification is 2+ or more severe; a vital capacity that is less than 80% of predicted according to the Kory formula and a single breath diffusing capacity that is less than 80% of predicted according to our own normal standards; and definite finger clubbing. Any individual that had three or more of these six clinical criteria was considered to have asbestosis, the severity of "moderate" or "severe" being based on the severity of these abnormalities particularly the chest roentgenogram.

Individuals with moderately advanced asbestosis: 8 (12.3%)

Humphreys
Pimental
Fortin
Hewitt
Couture
Lewis
Haybutt
Clark

Among these individuals there were the following symptoms and signs: An x-ray of 2/1 or more severe (8), a single breath diffusing capacity less than 80% of predicted (8), vital capacity less than 80% of predicted (3), marked clubbing (3), dry rales (4), and dyspnea Grade 2 or more (1). This group is remarkable only because of the low prevalence of shortness of breath. Among these 8 individuals one had 5 criteria, 5 had 4 criteria, and 2 had 3 of the criteria.

You will note that a number of individuals, particularly among those exposed for more than 10 years, had one or two of the criteria. The significance of these, particularly of an isolated reduction of vital capacity or diffusing capacity is not clear at the moment and the solution of this problem is one of our principal research efforts.

Three other individuals deserve special comment:

4818, Mr. Shattuck, had 4 of the criteria including clubbing, a vital capacity of 67%, a diffusing capacity of 64% and a 2/1 x-ray. He has been employed at J.-M. for 32 years. However, he had chest trauma as a child with many fractured ribs, had an abnormal x-ray while in the service in 1940 and presently has an asymmetrical chest wall with extensive pleural calcifications on the side of the old trauma. In addition he also has some degree of obstructive lung disease. We feel that this man most likely has moderately advanced asbestosis particularly because of the finger clubbing but that evaluation of his other data is impossible in the light of his chest trauma and calcifications.

4855, Mr. Guillemette: This patient had a 2/1 x-ray, and a diffusing capacity of only 48%. However, he has been employed at J.-M. for only 7 years and his pre-employment x-ray showed exactly the same 2/1 changes as his present film does. He was employed at a fertiliser plant for many years with heavy dust exposure with a great variety of minerals. We conclude that this man has interstitial pneumonitis of unknown etiology.

JM 0311046

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4028, Sinard: This man has a vital capacity of 79%, a diffusing capacity of 67% and a 1/2 x-ray. In other words, he has only 2 of the criteria mentioned above. He has been employed at J.-M. only 11 years and his pre-employment film at that time showed exactly the same slight changes that are seen now. He also had a markedly elevated right diaphragm 11 years ago and now. We conclude that this man has minimal pulmonary fibrosis or interstitial pneumonitis of unknown etiology.

Other Pulmonary Disease:

Chronic Bronchitis	10	(4 with asbestosis)
Emphysema	8	(1 with asbestosis)
Bronchial Asthma (asymptomatic)	2	
Acute Bronchopneumonia	1	
Severe Chest Trauma Sequellae	1	(with ? asbestosis)

Other Concurrent Disease:

Marked Obesity	5
Hypertension	8
ASHD with or without Angina	4
Rheumatoid Arthritis	2
Diabetes	1
Idiopath. Hypoglycemia	1
Duodenal Ulcer	1
Thyrotoxicosis (Treated)	1
Glaucoma (Treated)	1

Suggestions for Re-Evaluation:

Mr. Mall has discussed with me a suitable schedule for future re-evaluation. From the three attached tables you will note that virtually all of the above-mentioned abnormalities, both as isolated findings and combined for "asbestosis," occurred in men employed for 10 years or more. We would suggest, therefore, that all men employed for 10 or more years have an annual re-evaluation, in groups of 4, approximately during the same months that they were seen in 1971 or 1972. This would represent approximately two-thirds of the group. In addition, we would suggest that we see all men who have been employed one year or more and who have not been seen previously. As for the remainder, I would think that examination every other year or possibly every three years should suffice. Previous surveys at other plants suggest that probably every three years would be a more suitable interval.

Other Studies:

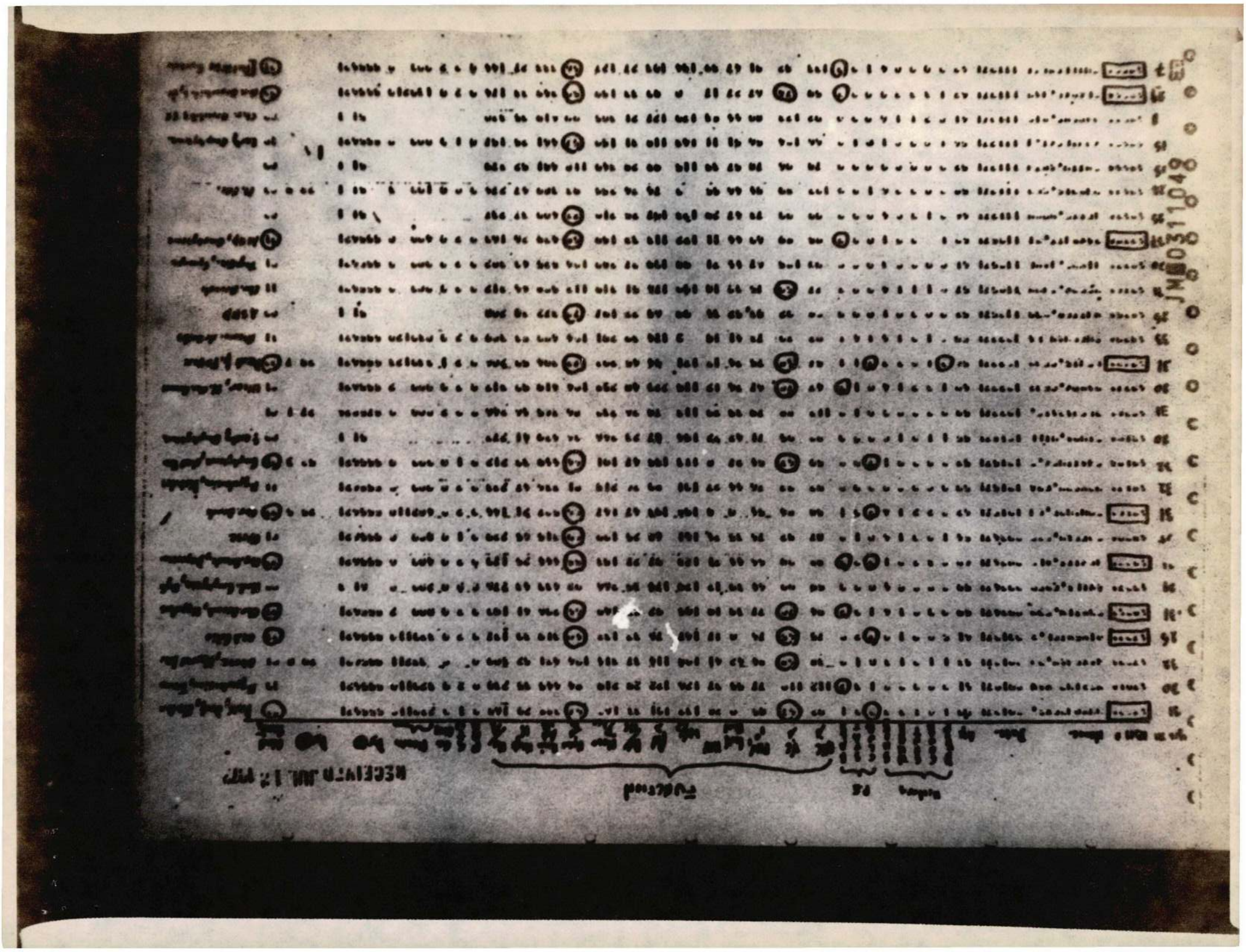
During this survey we made two-X and three-X x-ray magnification studies of the right lower half of the lung field of all workers. These films are now being interpreted by a group that is not familiar with the age or exposure history of these individuals. You will be informed if this additional study should prove rewarding. All men also had casts made of their right index finger. It does not appear at the moment that various quantitative morphometric studies of these casts will be more rewarding than simple inspection by a knowledgeable physician. All of the studies included here were performed by a small on-line computer that prepared the spirometer, added gases, switched valves, read gas concentrations and calculated and reported all of the results. Also in this group, all the data were subsequently recalculated by hand. Among the 46 measurements made in each of the 63 individuals

JM0311047

the computer was in error on one occasion when a subject exhaled a small amount and then hesitated for a considerable time before completing the vital capacity. That is one error in 2,990 determinations. The technicians and physicians who subsequently recalculated all of these results made 47 errors in these same 2,990 determinations.

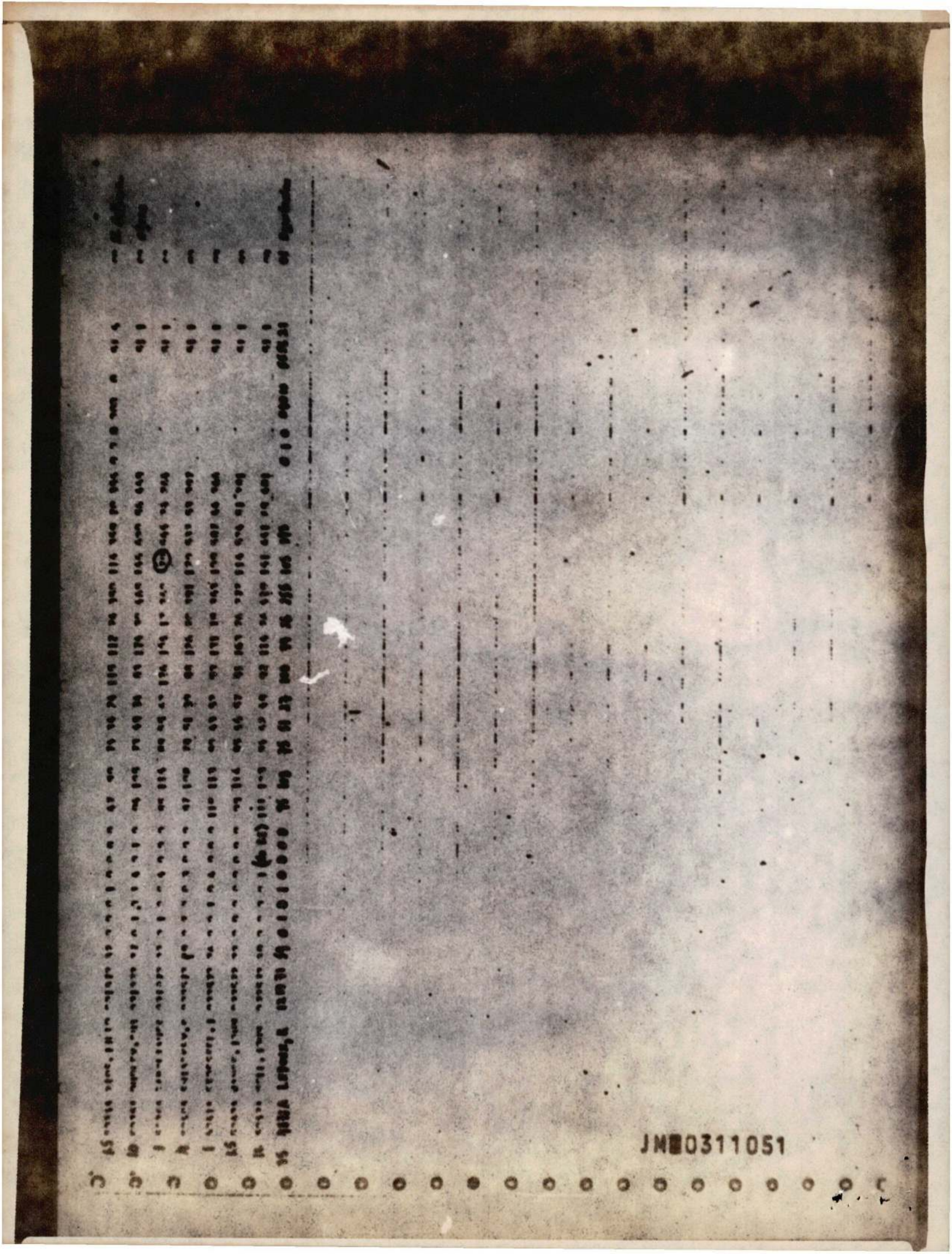
The Thoracic Services of Boston University have been awarded a SCOR (Specialized Center of Research) grant in the pulmonary field on June 1 of this year. Evaluation of the causes and natural history of chronic interstitial pneumonia including asbestosis is one of the main subjects of study. We are looking forward to continue this work for Raybestos and we are now considering the inclusion of an unexposed control population from that local area. We found at a shipyard in Maine that a great deal of pulmonary disease attributed to asbestos exposure was in fact "random noise" and occurred with almost the same frequency in unexposed persons. We would also be glad if you would consider extending this study to your other two plants in the New England area.

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Asbestos Information Association/North America

22 East 40th Street
New York, N. Y. 10016
(212) ~~691-8296~~
689 3379

I-6

July 12, 1972

TO: AIA/NA MEMBER COMPANIES
AIA/NA ENVIRONMENTAL CONTROL SUB-COMMITTEE
AIA/NA LEGAL COUNSEL

James Armstrong	- Bendix Corporation
E. C. Bratt	- H. K. Porter Company, Inc.
G. G. Gabrielson, Jr.	- Nicolet Industries, Inc.
Bernard Gross	- American Bilt Rite Rubber Company
J. Hall	- GAF Corporation
H. M. Jackson	- Johns-Manville Corporation
W. N. Johnson	- Union Carbide Corporation
A. R. Hooker	- The Flintkote Company
C. A. Neumann	- Kentile Floors Incorporated
G. W. Nickel	- Armstrong Cork Company
Clifford Seymour	- The Carborundum Company
J. R. Stetson	- Congoleum Industries, Inc.
Philip Weinstein	- Evertex Incorporated
G. W. Wright, M.D.	- St. Luke's Hospital

Gentlemen:

Inadvertently, the list of non-locked-in asbestos containing products which was to have been attached to our July 5 mailing was not included. Attached, therefore, is the list as originally promised.

It has come to our attention that a number of companies still have questions concerning whether certain asbestos-containing products which they manufacture should or should not be labeled. The standard is rather indefinite in that it calls for warning lables on products which "during any reasonably foreseeable use" may create airborne concentrations of asbestos in excess of prescribed limits. The Occupational Safety and Health Act itself states that "any standard promulgated ... shall prescribe the use of labels or other appropriate forms of warning as are necessary to insure that employees are apprised of all hazards to which they are exposed, relevant symptoms and appropriate emergency treatments, and proper conditions and precautions of safe use or exposure." Quite obviously, the rather simple

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CM1

warning label prescribed in the regulations does not meet all of the criteria described in the law, which only adds to the problem.

Each company will have to decide for itself whether a particular product requires a label or not. Obviously, there should be uniformity on this subject, because if one company decides to label a certain product, and another company decides not to label the same product, the latter company whould be placed in a most untenable position with OSHA. It is our understanding that OSHA is planning to use the list of non-locked-in products submitted by Dr. Fred Pundsack of J-M at the March hearing as its labeling criteria. If this list is followed, difficulties with OSHA should be few.

Nevertheless, there are always products which do not fit any list, or which may produce levels in excess of the standard at one step in the application or handling process. For example, the field cutting or trimming of asbestos-cement pipe might produce levels in excess of the standard, but only for the man doing the actual cutting and only very intermittently or rarely. Thus, to place a warning label on asbestos-cement pipe would be quite misleading in that it would alarm all those handling the product, when only one man has a potential excess exposure.

Our recommendations to you on labeling would thus be as follows:

1. If the product is included on the list of non-locked-in products, it should be labeled.

2. If a product is <u>not</u> included on the list of non-locked-in products but you consider it to be a border line case, <u>or</u> if the product has an occasional handling or fabrication problem, the following options are open:

   a. Label it and be on the safe side.

   b. Do not label it and hope OSHA doesn't question your decision.

   c. Conduct tests to determine if the use of the product does indeed produce levels in excess of the standard. Chances are that

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most product uses of this type will meet the eight hour TWA standard of five fibers, and that most problems will be in meeting the ten fiber ceiling standard. If tests determine that neither standard is exceeded, the product obviously need not be labeled. The test results should be kept in readiness in case an OSHA inspector questions your decision.

d. If the eight hour time weighted average is above five fibers per cc, then the product should be labeled.

e. If the ceiling value is above ten fibers per cc, which is the more likely of the two possibilities, then the use of the product should be examined to determine (1) how far above ten fibers per cc is the ceiling value, (2) does this particular work practice or use of the product occur frequently, intermittently, or only rarely, (3) can the product be applied, cut, trimmed, etc. in another fashion such that the ceiling level does not exceed ten fibers per cc. After these questions have been answered, it will be up to the individual company involved to weigh each answer carefully and to arrive at a decision based on the simple proposition: Does this product or its use place the health of workmen in jeopardy? Obviously, if the answer is "yes," the product should be labeled. If, on the other hand, you honestly believe that the answer is "No!" then you should not feel constrained to label the product, nevertheless you must be prepared to defend your position with OSHA should they question it.

There are a number of ways that you can place your company in a better defensive position should OSHA challenge your decision not to label a particular product. The basic idea would be for you to alert the purchasers of this particular product that one or more operations in the handling, application, cutting, etc. of the product might produce levels in excess of the standard and that

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precautions should be taken. This could be done through personal contact between industry salesmen and customers, or in the form of an instruction sheet delivered with the order that might specify certain work practices or types of machinery that should be used to keep dust levels low. The instruction sheet, for example, might say nothing more than "Powered bench saws without collectors should not be used in cutting this product. If this is impractable, operator should be provided with a U.S. Bureau of Mines approved respirator."

An approach of this type, or one somewhat similar, would indicate to OSHA, should the question arise, good faith on your part.

With regard to the coordination of industry labeling practices, if your company has decided to label a product not included on the attached non-locked-in list, I would appreciate being notified of this decision and the rationale behind it as soon as possible, so that a uniform position can be established with other companies in the industry manufacturing the same product.

If you have any questions or problems with regard to labeling, please feel free to contact us at any time. I would not advise your asking OSHA for a decision on whether or not to label a certain product. Almost assuredly they will tell you to label any border line product, and that decision will become binding for the rest of the industry as well.

Very truly yours,

Matt

Matthew M. Swetonic
Executive Secretary

Enclosure

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J. Bob Campbell - Denver
sent 02/06/73

CONFIDENTIAL

January 26, 1973

C. B. Allen

cc:
G. L. Swallow
file

WAUKEGAN TRANSITE PIPE - DUST STATIONS OVER TLV - REQUEST FOR SPECIAL PRIORITY

The following dust stations have been sampled as per your letter of January 15, 1973. The results which appear in this letter will also appear in the report of the annual Industrial Hygiene survey now in progress. The results which you requested are as follows:

Station	Result	TLV
D-8F Drag Saw Operator	1.8 f/cc 3.9 mppcf	5.0 f/cc 13.2 mppcf
D-13F Small Coupling Cut-Off Operator	0.4 f/cc 1.4 mppcf	5.0 f/cc 13.2 mppcf
D-15F Large Coupling Cut-Off Operator	0.5 f/cc 3.3 mppcf	5.0 f/cc 13.9 mppcf
D-22F Non-pressure Pipe Lathe - South Side Operator	0.2 f/cc 0.8 mppcf	5.0 f/cc 8.3 mppcf
D-24F Take-off Operator for Non-pressure Pipe Lathe	0.3 f/cc 1.1 mppcf	5.0 f/cc 8.3 mppcf
D-25F Moulding Saw Booth Area	1.2 f/cc 3.4 mppcf	5.0 f/cc No TLV established
D-1WE Machine Tender #2 pipe machine	1.0 f/cc 0.8 mppcf	5.0 f/cc 17.9 mppcf
D-4WE Machine Tender #3 pipe machine	0.3 f/cc 1.2 mppcf	5.0 f/cc 17.9 mppcf
D-10WE Machine Tender #4 pipe machine	0.2 f/cc 2.0 mppcf	5.0 f/cc 17.9 mppcf
D-13WE North Willow Operator	2.9 f/cc	5.0 f/cc
D-15WE South Willow Operator	1.4 f/cc	5.0 f/cc
D-11S Unloading Boxcar of Asbestos Fiber	1.8 f/cc	5.0 f/cc
D-12S Ball Mill G.R.S.	0.9 mppcf	2.5 mppcf
D-14S Silica Unloading GRS	2.3 mppcf	2.5 mppcf
D-23S Unloading Boxcar of African Blue Fiber - Unloader	114.3 f/cc 169.6 f/cc	5.0 f/cc 5.0 f/cc
D-24S Unloading Boxcar of African Blue Fiber - G.R.S. inside boxcar	107.4 f/cc	5.0 f/cc

Please call if any questions arise about these results.

Robert W. Whitt

Robert W. Whitt
Waukegan Environmental Control

Legal Services
Denver - GHQ
April 12, 1973

W. R. Goodwin

Re: Asbestos and Health

Data on this subject establishes the following:

There will be no asbestos health problem in the future for workers who:

1. have not smoked cigarettes;

2. have been exposed only to relatively low doses of the order of 5 or fewer fibers/cc;

3. have not been exposed to crocidolite or amosite fibers.

Dr. Wright supports this statement.

J-M should, therefore, promptly:

a. Begin a concentrated and continuing program to educate employees working with asbestos on the danger of smoking.

b. Eliminate by a fixed date all stations exceeding a TLV of 5 fibers/cc and in the interim, make certain that workers at such stations wear effective respirators. (We all know respirators are not a satisfactory long-term solution.

c. Discontinue by a fixed date all use of crocidolite and amosite.

d. Recommend a, b and c to customers and assist them by providing information.

Failure to do the above things could subject the company to excessive future liabilities. Doing these things promptly will put J-M in a better position to counteract misleading publicity.

Too much of the respnse to recent critical publicity has been directed toward arguing about the past and minimizing

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the problem. We should stop attempting to defend the industry or relying on the industry, through AIA, to defend us. We should defend ourselves by first doing the practical things which best protect our employees (a, b and c above) and then by publicizing the fact that, regardless of the past, if everyone will do what we have done there will be no future asbestos health problem.

More specifically, we should prepare a full-page ad emphasizing in bold type, points 1, 2 and 3 and what J-M (not necessarily the industry) has done about a, b, c and d. At the same time, we can emphasize the fact that there is no danger to the public. The ad should include in small type descriptions of the data which support these points. We should also be prepared to make a corresponding video tape for use in counteracting misleading TV programs. The ad should be run in publications such as The Wall Street Journal just as soon as we have accomplished a, b and c.

If we do not accomplish a, b and c promptly, we will have lost perhaps our best opportunity to seize the initiative from the publicists, the unions and the government and thereby to persuade our customers and the public there is no need to discontinue use of chrysotile asbestos.

J. A. McKinney

cc: J. B. Jobe
F. H. May, Jr.
A. B. Marchant
J. E. Hesse
F. L. Pundsack
W. L. VanDerbeek
M. Harris
H. B. Moreno
C. E. Shepperly
F. J. Solon
W. F. Goodwin
E. F. Marriner
G. Wright

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Fairleigh Dickinson University
RUTHERFORD TEANECK MADISON

FLORHAM-MADISON CAMPUS
285 Madison Avenue
Madison, New Jersey 07940
Area Code 201
377-4700

17 April 1973

Dr. F. L. Pundsack
Johns-Manville Corp.
P.O. Box 5108
Denver, Colorado 80217

Dear Dr. Pundsack:

Enclosed is an abstract of a paper that we would like to present at a meeting of the American Industrial Hygiene Association in Boston on 23rd of May.

Benzo(a)pyrene is a carcinogen known to be present in cigarette smoke. The paper offers data to show that chrysotile delays clearance of benzo(a)pyrene from hamster lungs.

The current (April) issue of Arch. Environmental Health carries on pages 197-201 a paper by Creasia et al at Oak Ridge showing that flu virus infection delays clearance of chromic oxide dust from mouse lungs.

Their findings and ours thus suggest that non-specific irritation of lungs may allow carcinogens to reside longer and hence enhance tumorigenesis.

Our work on this problem was carried out under support from Johns-Manville Fund and Rippel Foundation. We are preparing a manuscript and will offer it for your comment before submitting it to a journal.

Sincerely,

Bill

William E. Smith, M.D.
Director
Health Research Institute

WES/elc
cc: Dr. J. Leineweber
Dr. E. Marriner
Dr. S. Speil
Dr. G. Wright

FILE

J. M. Bodder - Atlanta July 31, 1973

H. W. Hendry

H. D. Webb - Joffrey

PROKO
YOUR REPORT JULY 24TH

We were interested to note the plan to ship 50 pounds stepped end bags of 7SF61 to all plants of Proko, and we assume that Morton Webb is fully conversant with this picture.

We are not happy with the dust situation you describe at Proko and we can conclude that they will encounter problems in the future. If, however, the asbestos fiber shipments arrive in good shape, free from damage and can be handled within the OSHA standards our problems should be minimal. It will be important for you to make sure that this condition prevails.

H. W. Hendry

1-0

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Atlanta, Georgia
July 24, 1973

JUL 27 1973

cc: W. W. Hendry - GHQ-3W
J. F. Reis - GHQ-3W
M. D. Webb - Asbestos 1500
File

PROMO
DALLAS, TEXAS

The performance of TRF02 at all plants is good and the scheduling technique we have been using has assured all plants (Dallas, Cambridge City, and Wayeross) of a dependable source. Business has fallen off some and as a result, only one car is scheduled for August.

We have been given the go-ahead for 50 pounds stepped end bags for all locations. Loads are not to be glued and unitized on shipments going to Dallas, but experimental loadings will be welcomed at the other locations where plant techniques allow for mechanical unloading. The ceiling at the Dallas Wall St. plant is so low that all materials must be moved with motorized hand trucks. A fork lift cannot be used. In addition, all raw materials are stored in the second floor and moved there by conveyor. All Dallas rail cars are unloaded with day labor. I witnessed the unloading of a car of "whiting" and have never seen such a horribly dusty mess. Broken bags were indescriminately tossed on the conveyor and as a result, a trail of "whiting" could be traced from the box car to the storage area.

Air samples were taken by Promo's Insurance Company, and the result was a clean bill of health. I was flabbergasted and questioned farther. The sampling technique apparently left something to be desired, but the net result indicated that since the insurance company gave them an "ok", they are dismissing any further work to control dust. The primary source of the contamination occurs in the box cars and any further work would require expenditures to allow mechanical unloading, etc.

They have been informed of our environmental services.

J. M. Bodder - Atlanta

sf

1-0

Johns-Manville

Greenwood Plaza
Denver, Colorado 80217
(303) 770-1000

July 26, 1973

Mr. C. L. Sheckler
838 South Drive
Metedeconk, New Jersey 08723

Dear Cliff:

Attached is a brief description of the silica-asbestos study for Stockton and Manville as I see it.

If you have any comments or corrections, please send them along. I am still a little unsure just how much the $60,000 includes - Stockton and Manville or just Stockton. Perhaps a call to Phil would straighten it out. Since we may have a bit of a problem getting George's approval, we had better have all the "ducks in a row".

Yes, after talking to Hugh, I believe the two of us can escort this research project through the proper channels.

Cliff, I agree we at J-M have a very strong moral obligation to our people to find some answers. J-M is the only quantity source of this type of information available.

I'll keep you posted on all developments and will call when I return from California - August 3.

Best regards and good luck with the new boat.

Very truly yours,

W. B. Reitze

CP -100

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Johns-Manville

Internal Correspondence

To: H. Moreno

Date: 20 August 1973

From: Dr. George Wright

Copies: S. Lane
F. May
J. McKinney

Subject:

DO NOT DISCARD

Some time ago, among others, I expressed the opinion that it would be worth considering a try at removing all Amosite from Maranite. For my part, this was based upon the absence of a specific hygiene standard for Amosite and the fact that Selikoff was using the adverse health experience of the Patterson, N. J. plant as an example of the unusually serious toxic effect of Amosite. In addition, at that time we were impressed with the concept that if we could remove asbestos from those exposures where control was difficult for the "user" and where Selikoff was "active" - insulation and construction in general - it would be useful.

Since then two developments have occurred. The U.K. has set a standard of 2 fibers per cc for Amosite - the same as for chrysotile. They are of the opinion that Amosite is not more toxic than chrysotile. Admittedly, there is a paucity of data about pure Amosite exposure, but it would appear that they believe the Patterson experience was due to very heavy doses - levels rarely met in the past uses of chrysotile. I am inclined to agree with them but still have some reservations that the "nature" of Amosite fiber might lead to greater retention of inhaled fibers. Second, it is now clear that Selikoff is pursuing studies of industrial populations other than "insulation workers" and there is little or no validity to the idea that removal of asbestos from certain products will limit his sphere of interest and activity.

At this time, I believe the use of Amosite in circumstances where those engaged in manufacture or use of a product will not be exposed to more than 2 fibers per cc TWA or a peak of more than 10 f/cc would be acceptable from both a health protection and a medico-legal point of view. This will not be easy to achieve.

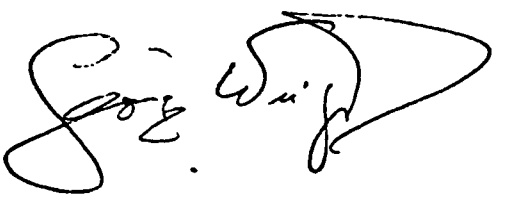
I have reviewed the old and current dust conditions at Billerica and have talked with Bill Reitze about the health experience of employees there - insofar as that is known. It is apparent that Billerica has had one of the poorest

health experiences in the Corporation with respect to asbestosis and cancer. This is readily explained by the past high exposures... Although there has been improvement in the dust conditions, few stations have achieved 2 f/cc, many are still above 5, and too many are much higher than that. From the records there is inconsistency of performance - stations fluctuating from 5 to 25 or more fibers per cc. Moreover, the conclusion that wearing a mask is being substituted for proper control seems inescapable. There also are questions about current methods of solid waste disposal.

Engineering controls properly and continously supervised to guarantee holding the fiber count below 2 f/cc should be achievable and in the light of what we know now, is required to assure the health of those engaged in manufacturing at Billerica. The proper use of a mask for known "temporary" higher exposure, the correction of which is in progress, can be tolerated for a short time but should not be condoned as a substitute for proper controls. If brief exposure to peaks above 10 are essential, a properly used "ventilated" helmet is required.

Protection of the users of the product must also be considered. The products used in the metals industry ought to be controllable by adequate consultation with the users. We need to know what is the actual exposure of users in other fields where control is more difficult, such as construction work, and where the user might be ignorant of potential hazard or inclined to ignore warning labels. One cannot depend upon a high level of protection motivation in such areas. If Maranite poses a health threat for these users, the situation must be remedied.

If my comments raise what appear to be insurmountable obstacles bear in mind the achievements along these lines elsewhere in the Corporation in the recent past.



Johns-Manville

Internal Correspondence

To: W. B. Reitze - GHQ, Denver

Date: December 6, 1973

From: E. L. Randolph, Pittsburg Plant ELR

Copies: File

J. W. Cook
Please Note Final Return
#12

Subject: LISTING PNEUMOCONIOSIS CASES
PITTSBURG PLANT

As per our phone conversation of December 5, 1973, enclosed is a copy of all identified chest cases at Pittsburg Plant.

Included on the list is the mesothelioma case as indicated by our conversation.

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Min. Dept. [illegible] RN

Confidential — Listing Pneumoconiosis Cases

Name	Grade	1st identification xray	
1. Anderson, John	P-1	1969	
2. Antsey, Matthew	P-2	1965	
3. Asher, Bert	P-2	1959	retired
4. Broughton, James	P-1	1966	
5. Bovert, Eli	P-2	1948	
6. Bigno, Ned	P-1	1958	
7. Brady, John	P-1+	1969	
8. Bucak, Mike	P-2	1949	
9. Beggs, Bernta	P-2	1955	retired
10. Biles, Earl (648-230)	P-2+	1963	
11. Bellieci, John (648-233)	P-2	1970	
12. Braswell, Theron	P-1	1958	
13. Castleman, Don	P-1	1960	retired
14. Davis, Alvin	P-2	1963	
15. DeCrnellas, Robert (648-266)	P-2	1948	
16. Davis, Mack	P-1+	1970	
17. Flavetta, Tom	P-2	1946	
18. Frizzell, Preston	P-2	1960	
19. Farkas, Alex	P-2+	1951	retired
20. Gabbardt, Tom	P-1	1963	
21. Garrett, Luther	P-2	1947	
22. Graham, George	P-2	1968	
23. Gray, Don	P-2	1968	
24. Grain, James	P-1+	1964	
25. Curtis, Henry	P-1	1963	
26. Griffin, James	P-2	1946	retired
27. Gray, Robert (648-261)	P-1	1970	

PP 004478

Med Dept

Name		Grade	Date ident.	
28. Harris, William	(c46-231)	P-2	1967	
29. Harding, David		P-2	1963	
30. Harris, Barnie		P-2	1961	
31. Hobelheinrich, Emil		P-2	1947	
32. Horton, Robert		P-2	1964	
33. Haggard, Claude		P-2	1951	retired
34. Harrison, Willis		P-2	1966	term.
35. Infelise, Louis		P-2	1954	
36. Jennings, Ellis		P-2	1962	
37. Kelly, Wayne		P-2	1947	
38. Herron, William		P-1	1965	
39. Laufenberg, Gerald		P-1	1967	term.
40. Laufenberg, LeRoy		P-2	1957	retired
41. Lane, Harrell		P-2	1966	retired
42. Lobuis, Willard		P-2	1955	term.
43. Larson, E.A.	(c46-11C)	P-2+	1960	retired
44. McBride, J.E.		P-1	1967	
45. Manning, Duward		P-2	1947	
46. McKinnon, Curtis		P-2	1952	
47. McMasters, Lawrence		P-2	1969	
48. McGovern, L.E.		P-2	1966	
49. Mendoza, Elias		P-2	1949	
50. Neuman, Harold		P-1	1967	
51. Nolan, Archie		P-1	1947	
52. Ellis, Raymond		P-1	1949	
53. Orsi, Richard		P-2	1960	
54. Pineda, Antonio	(c46-234)	P-2	1960	
55. Perano, Frank	(c46-[illegible])	P-2+	1964	retired
56. Pocierzaj, Rudolph		P-2	1969	retired

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Mine Except

Name	Grade	Date left mine
57.Powell,Charlie	P-2	1969
58.Howlett,Clifton	P-1	1949
59.Russo,Meno	P-1	1967
60.Ralston,Robert F	P-2	1951
61.Randazzo,Anthony	P-2	1966
62.Reilly,Joseph	P-2	1959
63.Rubiales,Diego	P-2	1946
64.Ruckin,Reba	P-2	1968
65.Russo,Vincent (c46-247)	P-2	1966
66.Ramirez,Rafael	P-1+	1967
67.Retherford,Raymond	P-1	1957
68.Rosenquist,Bruno	P-2	1964 retired
69.Smith,Guy	P-2	1961
70.Speake,Bob	P-2	1965
Scola,Fred	P-1+	1963
Stockton,Almus	P-2	1966
73.Sanders,J.C.	P-2	1966 Deceased
74.Spanger,Peter	P-1+	1963 Retired
75.Townsend,Charles	P-2	1965
76.Thomas,James	P-2+	1964
77.Vangley,William	P-1	1947
78.Vela,Ignacio (c46-248)	P-2	1967
79.Vela,Marcos (c46-149)	P-3	1965 retired
80.Ward,Leonard	P-1	1955
81.Webb,Goodlow	P-1	1966
82.Webb,Roy	P-2	1968
83.Wilson,W.C.	P-2	1963
84.Watson,Levin	P-1	1947 retired

PP 004480

Med Dept

Name		Grade	date ident.	
85. Wallen, James	(048-232)	P-2+	1966	
86. Yates, Edward		P-2	1967	retired
87. Young, John		P-1	1962	
88. Lewis, Benjamin		P-1	1969	
89. Davi, Joseph		P-1+	1970	
90. Peebles, Walter	(048-234)	P-1+	1967	deceased
91. Brewer, Harold	(048-47)	P-1+ carcinoma	1958	deceased 1973
92. Furtado, David	(048-139)	asbestosis 3	1967	deceased
93. Jordan, James	(048-112)	P-2+	1965	retired
94. Greathouse, Charles	(048-148)	P-2	1968	retired
95. Wood, Frank		P-2+	1967	deceased
96. Walquist, Walter		mesothelioma		deceased

PP 004481



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HEALTH AND SAFETY PROGRAM OF JOHNS-MANVILLE

George W. Wright, M. D.

1973-74

5500 01272

(1520) 5832

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While the Industrial Revolution of the early 19th Century developed the methods for greatly augmenting production, it did so at a cost of human values too great to sustain such a one sided materialistic pursuit. During the latter half of the 19th and early 20th century humanitarian reforms were the natural outcome of the over-emphasis on materialism and its handmaiden of human degradation. The impetus of these reforms together with the rapidly changing social conscience along many other lines led to a great improvement in conditions of work, commerce and welfare. During this century some setbacks and delays occured as a result of the need to sacrifice gains in working conditions under the over-riding demands for production during the two major World Wars. One now hears affirmations of humanitarianism not audible 50 years ago or even conceivable 100 years ago.

There are an ever increasing number of persons responsible for industrial policy, both management and labor, who now say, and mean it, that production under the drive of the profit motive must take full recognition of the requirement that this be accomplished without adverse effects upon the health and safety of those who produce or use the product or those residing in the communities where production or use occurs. This goal has repeatedly been voiced and consistently pursued by those responsible for Johns-Manville policy. Never-the-less, I believe most would agree the goal has not yet been reached and even when it is, a persistent effort will be required to maintain it. Under the ever changing conditions of production and profit making, this goal is constantly in jeopardy. Events of the past year or so strongly

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indicate a need for Johns-Manville to re-appraise its program with respect to the methods it is using to reach this goal.

The operational approaches to this goal are not apt to remain static. Never-the-less there are some, more fixed, policies that can be indicated as necessary if J-M is to come as close to the goal as is humanly possible. The first of these is that the commitment to this goal must be made from the very apex of the organization and in such a way that the commitment is convincing to the operating level both management and labor. Second, over-all development and supervision of the modalities to be used in reaching this goal should be in the hands of one person who has this responsibility as his primary or sole assignment. Third, this person must be given tools in the way of personel and influence adequate for him to be able to discharge his responsibility. Fourth, there should be a setting in which competition between demand for controls can be balanced against need for controls. This is a subtle but most important point. The question of over or under-doing the protective efforts is frequently raised. Resolution of such questions should be on an adversary basis with the opportunity for resolution at the highest level in the corporation. Fifth, there must be a mechanism for recognizing potential safety and health hazards before they become a commited part of the corporate activity. Sixth, there must be a mechanism for rapid evaluation of the effectiveness of the total program.

I have the impression that Johns-Manville, in spite of its early commitment to an optimum safety and health program, came out of

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the Second World War, and its associated period of laxness in these matters, without an adequate program and with other problems that appeared to be of a more pressing nature. Pace was not kept with what was known and with what others in fact were doing. Some of these shortcomings could, if need be, be documented.

The following changes and additions in organization might be considered as favoring the development of a program to improve J-M's position with respect to health and safety.

(1) The President and ranking officers should find a means of voicing their commitment to profitable production but not at the expense of health and safety. Doubtless, all concerned beleive in this premise. However, do they and their associates at this level consistantly act on this premise? For example, when a person is being evaluated for promotion is consideration given to the effectiveness with which he has prevented injuries or adverse health affects. I would note here that I doubt if any person deliberately violates good health and safety procedure while I am reasonably certain that some do so out of ignorance.

(2) The President and perhaps the Board of Directors should overtly take the ultimate responsibility for the health and safety commitment by establishing a way of frequently reviewing the progress and status of the broad aspects of J-M's health and safety record.

To accomplish the commitment of "profitable production without

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impairment of health and safety," the now fragmented parts of the program needed to bring this about should be brought together under one person possessing the required expertise at a rank which will guarantee access directly to the President and indicative of the commitment of the corporation to the program. The rank should be such as to give the director of the program sufficient status to press his opinions which may at times be adversary in nature. Under the directors supervision and responsibility should be the following disciplines.

(1) Industrial hygiene and toxicology: This discipline together with safety is the heart of any program designed to prevent impairment of health of the workers. If properly operated it will provide the information necessary to prevent adverse health effects before they occur. The information obtained must, of course, be acted upon in time. It should be noted that "toxicology" is combined with industrial hygiene. These two disciplines compliment one another and are less useful alone. J-M has not had the services of a professional toxicologist to date. To utilize medical or hygiene personel for this is helpful but not entirely satisfactory.

(2) Safety: This is the other major contributor to the health maintenance program, especially in regard to prevention of injury. This discipline depends heavily on continuous education as well as proper equipment, warnings and supervision.

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(3) Medical Program: This discipline has changed over the years from one solely of handling injuries and illness incurred on the production premises to one of monitoring and prevention of health impairment. The medical program also has generally served as the main source of advice regarding toxicology and medical aspects of Workman's Compenstion. In the past there has been a tendency to put a physician trained in general surgery or medicine in charge of such a program with little attention being paid to the fact that the heart of the program is prevention: In recent years a cadre of physicians particularly trained in preventive medicine and health maintenance has emerged. At present, most large corporations have a physician trained in this manner in charge of the overall health and safety program.

(4) Program to involve management and labor in a continuous maximum effort to carry out optimum work practices promoting health and safety: No program attempting to reach the highest performance with respect to health and safety preservation can succeed on the basis of management effort alone. The worker must become an integral part of this program with regard to recommendations, knowledge of the status of the program and methods of acheiving compliance. This is a continuous educational and study program in which the health and safety program provides a

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a continuous input. If adequate modalities for accomplishing this sort of merger between management and labor do not now exist they must be found.

(5) Supervision of compliance with Government regulations concerning the Environment, Safety and Medical programs: This is becoming a sufficiently complicated matter to require it become a primary responsibility of one or more persons. Much can be accomplished in promoting the J-M health and safety program through the various Government regulations. On the other hand they should not be slavishly followed with the thought that they guarantee a successful health and safety program. At times the performance must be better than is asked for by Government regulation. Moreover, Government regulations commonly develope after, and not before, adverse health or safety conditions occur. It is short sighted to rest on the attitude that a corporations program complies with government regulations and nothing more need be done.

(6) Workman's Compensation: As originally conceived years ago Workman's Compensation was aimed at providing compensation for those persons suffering from impairments or injuries arising out of their employment. Under this stimulus a great deal of advance was made in the betterment of working conditions and prevention of health impairment and injury. There was a time when the cost of Workman's Compensation

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was a reasonably accurate measure of the effectiveness of the health and safety program. At present however, Workman's Compensation appears to be more of a social instrument in general welfare and labor relations. Strong medical input seems to be of less use and the total cost of Workman's Compensation a less accurate measure of effectiveness of health maintenance. There has developed a regretable attitude of looking upon Workman's Compenstion as a cost of doing business rather than a reflection of avoidable injury and impairment. It is difficult at present to know where to place the management of this function. There would be merit to placing this program in the purview of the director of the Health and Safety Program. An effort to bring it under more rigorous surveillance might return it to its original status and tend to lessen the trend it now has of serving as a social instrument.

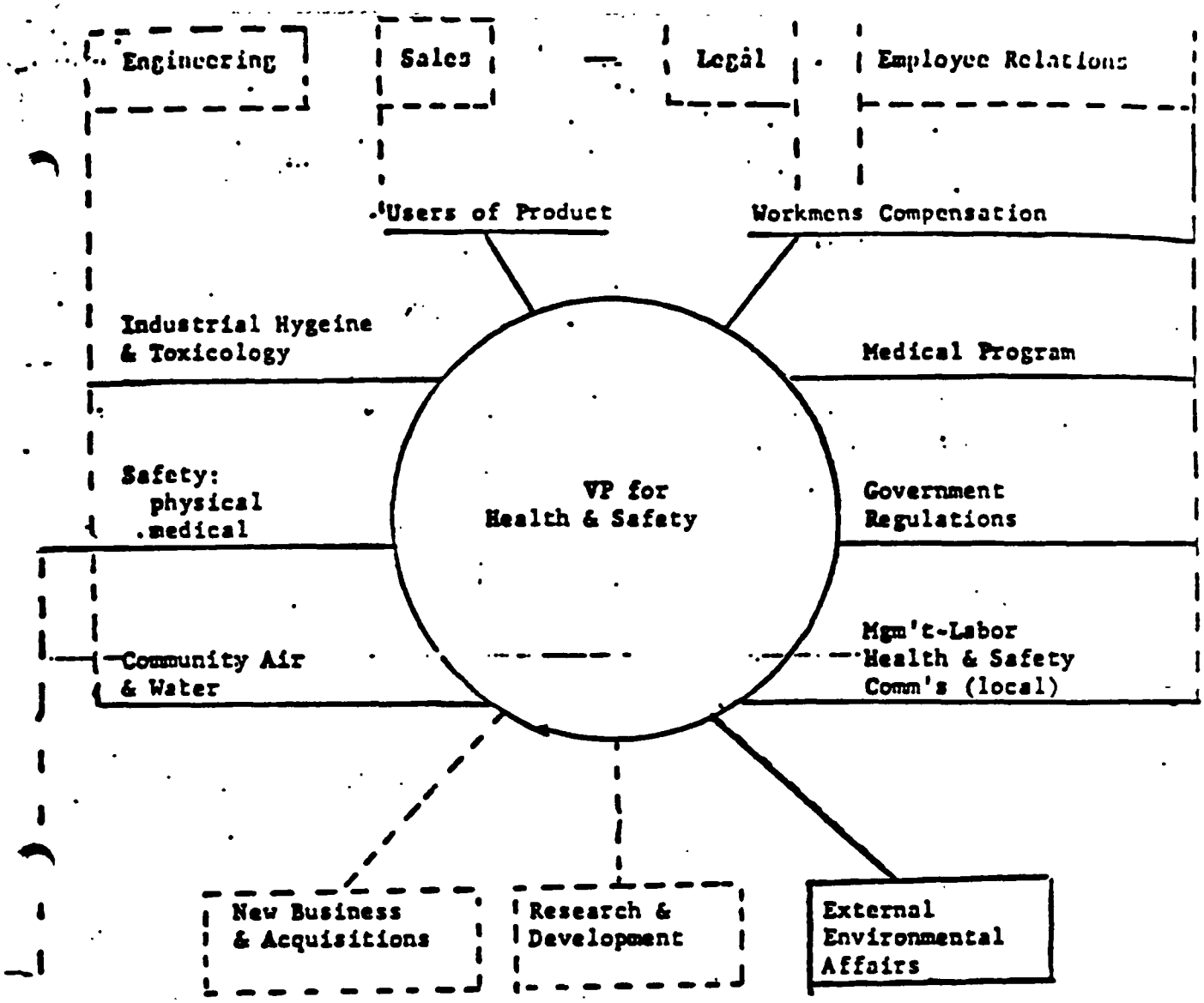
Not included in this overall discussion is the problem of protecting the user of the products made by J-M and the community in which production procedures are carried out. It would be entirely appropriate for these responsibilities to be added to the overall health and safety program. On the other hand, there might be merit to developing these two features in a separate manner since different populations and regulating agencies are involved. On balance, I believe they should be incorporated into one group responsibility so that common technical expertise and knowledge could be made use of.

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The various disciplines suggested for recruitment into a common program are so highly inter-related that each would suffer if left isolated. Moreover, the program as a whole would fall short of what it might achieve if they are not combined and thus bring to bear their various influences on the common problem.

The accompanying chart shows the makeup of the proposed grouping and some areas of essential co-ordination with other Divisions of the Corporation.

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