

A Study of Workers Exposed to Asbestiform Minerals in Commercial Talc Manufacture

M. KLEINFELD, J. MESSITE, AND A. M. LANGER

*New York State Department of Labor Division of Industrial Hygiene,
New York, New York 10013 and Environmental Sciences Laboratory,
Mount Sinai School of Medicine, New York, New York 10029*

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A clinical and environmental study was made of a group of 39 workers exposed to commercial talc dust, of which tremolite and anthophyllite were the major fibrous components and the findings were compared with a control group. The data showed that in spite of a mean exposure of 16.2 yr with a range of 11-22, only one of the workers exposed to commercial talc dust showed a chest roentgenogram consistent with pneumoconiosis. The only significant difference between talc workers and control was in the number of people having dyspnea and its severity. The authors considered both the element of smoking and the exposure to commercial talc as aggravating factors which accounted for the dyspnea. The findings of the 39 workers in the present study were compared to those obtained from 35 workers studied earlier in another talc plant. Both groups had similar mean durations of exposure to commercial talc but the degree of exposure of the group of 35 was appreciably greater. In the latter group there was a significantly increased prevalence of pneumoconiosis. It is possible that commercial talc containing tremolite and anthophyllite as major fibrous constituents may be less fibrogenic than chrysotile or amosite at the degrees of dust exposure present in this study.

Studies of the biologic response to different types of asbestos indicate that inhalation of chrysotile and/or amphibole asbestos dusts in concentrations present in some industrial environments, can produce pulmonary fibrosis (1). Disabling pneumoconiosis may occur after inhalation of an asbestos dust after an appreciable elapsed time from onset of exposure, up to 20 years or more (15). Morris *et al.* (2) in a study have reported that chrysotile produced less pulmonary fibrosis than amosite or crocidolite when comparable concentrations of these asbestos minerals were inhaled. These investigators have attributed the lesser pathogenicity of chrysotile to the ability of the lungs to eliminate it more rapidly than amosite or crocidolite. Recent data on anthophyllite exposure indicates the fiber to be both a fibrogen (16) and a carcinogen (17). Meurman (3) has suggested that pleural plaques and calcification seem to occur more frequently among people exposed to anthophyllite, but whether one type of asbestos is more pathogenic than another still remains to be established. The difficulty arises due to the influences of fiber size, other minerals and cofactors present in the asbestos dusts (4). Vigliani (5) cites Selikoff as having stated that differences in fibrogenicity may exist even between different sources of the same type of asbestos. Experimentally, observations in the guinea pig lung by Holt, Mills, and Young (6) show no differences in the fibrogenic response to four types of asbestos, namely, chrysotile, crocidolite, amosite, and anthophyllite. On the other

hand, Parazzi, Pernis, Secchi, and Vigliani (7) have shown that crocidolite produces a more marked cytotoxic action on guinea pig macrophages than does chrysotile. Schnitzer and Pundsack (8) in an earlier study observed that chrysotile fibers produce a marked hemolytic effect on suspension of washed sheep erythrocytes whereas crocidolite, amosite, tremolite, and anthophyllite produced negligible hemolytic effects. In a more recent study (personal communication to A.M.L.), the same authors found that the relative surface areas of chrysotile versus the amphibole group were among the major factors in determining whether or not the materials were potentially capable of producing hemolytic effects. Although the various authors cited above have shown different responses to different types of asbestos, their results do not justify drawing firm conclusions as to the relative pathogenicity of the different types of asbestos.

The present study deals with a group of 39 individuals who were exposed to commercial talc dust with tremolite and anthophyllite as its major fibrous component. The purpose of the study was to (a) correlate the environmental exposure with the clinical and roentgenographic findings in order to obtain information on a dose-response relationship among workers, all of whom had relatively long-term occupational exposure to commercial talc; and (b) obtain additional data on the composition and morphology of the commercial talc dusts.

MATERIALS AND METHODS

All of the workers in the study group were exposed to commercial talc for 10 or more yr. Each worker underwent a clinical evaluation which included a detailed occupational history, a physical examination and chest roentgenogram. A similar evaluation was made of 41 workers who lived in the same area as the talc workers and who were of the same sex and mean age and range but who had had no occupational dust exposure in their working environment. The 41 workers served as a control group. Dyspnea was graded using a modification of Fletcher's criteria (9). Only four of the five grades categorized by Fletcher were adopted for this study. The criteria for a positive smoking history was smoking of 20 or more cigarettes per day for a minimum of 5 yr.

In addition to the clinical and roentgenographic examinations, air samples were taken in both the workers' breathing zones and general air at various locations where the mining and milling of tremolite talc took place. Total particle counts as well as fiber counts were determined. The dust was collected by means of a midjet impinger and the samples were taken at a rate of 0.1 cpm for 10 min according to the Public Health Service method (10). Several 10-min samples were taken during the individuals work day to obtain results representative of a given worker's actual exposure. Particles were counted using the light field low-power method. The fibers were collected on a millipore filter and concentrations were determined using phase contrast illumination at 400 $\times$. The mineral nature of 16 talc samples from New York State was determined. These samples represented talc specimens obtained at different mining and milling operations, as well as the finished product. Techniques of analysis included polarized light microscopy, transmission electron microscopy with selected area diffraction, x-ray diffraction, and electron microprobe analysis.

TABLE 1
CLINICAL AND ENVIRONMENTAL DATA OF EXPOSED AND CONTROL GROUP

	Study group	Control	P
No.	39	41	
Age (yr) mean	45.9	48.8	N.S.
range	34-75	32-71	
Exposure (yr) mean	16.2	0 (0.0%)	
range	11-22	0 (0.0%)	
Radiologic findings compatible with pneumoconioses	1 (2.6%)	0 (0.0%)	N.S.
Clinical findings			
Cough	10 (25.6%)	5 (12.2%)	N.S.
Dyspnea	9 (23.1%)	3 (7.3%)	<0.05
Lung crepitations	2 (5.1%)	3 (7.3%)	N.S.
Clubbing	0 (0.0%)	0 (0.0%)	N.S.
Positive smoking history	19 (48.7%)	19 (46.3%)	N.S.

FINDINGS

Clinical. A summary of the clinical and environmental data of the 39 individuals in the study group as compared to the control group is shown in Table 1. Data showing the relationships of dyspnea and cough to age, smoking and duration of exposure are given in Table 2. The characteristics for each grade are given in Table 2. Table 3 summarizes the mean dust concentrations obtained for specific years between 1954 and 1970. Fiber counts were made only in 1970 as shown in Table 3. Comparative environmental, clinical and chest roentgeno-

TABLE 2
RELATIONSHIPS OF DYSPNEA AND COUGH TO AGE, SMOKING AND DURATION OF EXPOSURE IN THE STUDY GROUP

Case number	Age	Years exposure	Dyspnea grade ^a	Cough	Smoking	No packs cigarettes/day	Years
1	45	14	1	Productive	+	1	25
2	36	19	1	0	0		
3	45	15	1	Productive ^b	0		
4	53	15	1	Productive ^b	+	1	30
5	45	20	4	Productive	+	2	20
6	49	20	1	0	+	1.5	18
7	58	14	2	Productive	0		
8	50	19	4	Productive	+	2	31
9	55	15	1	0	0		

^a Four grades of dyspnea, a modification of Fletcher's grading (7), were used: Grade 1—able to walk normally without breathlessness on the level, but breathless on hurrying or climbing slight hills; Grade 2—able to keep on walking at own, slower than average pace on the level; Grade 3—forced to stop for breath when walking at own slow pace on the level; and Grade 4—breathless on slightest exertion such as washing or undressing.

^b Morning only.

TABLE 3
ENVIRONMENTAL DATA OBTAINED AT VARIOUS MINE AND MILL OPERATIONS

	Mean dust counts (mppcf)						Fiber count (fiber > 5 μ m/ml)
	1954	1958	1963	1964	1969	1970	1970
Mine							
Drilling	5		5		13	7	8
Dragline loading			7			10	16
Tramming & mucking					29	11	22
Primary crushing	2	26	23	18	13	48	260
Hoist loading				70	140	14	29
Mill							
Secondary crushing	12	23	8	10	12	13	13
Grinding (Wheeler mills)	15	13	5	3	11	19	30
Grinding (Hardinge mills)	18	14	4	7		8	33
Bagging	25	15	5	9	4	8	30
Palletizing	40			25	10	6	27
Bulk loading						10	8
Direct R.R. car loading of bags		109	39	31		62	

TABLE 4
DATA IN PRESENT PLANT COMPARED TO ANOTHER PLANT STUDIED PREVIOUSLY

	Present plant study	Comparative plant study	P
Environmental data* (mppcf)			
Mining			
Drilling	6	182	
Mucking	20	31	
Milling			
Crushing	15	117	
Milling	13	60	
Bagging	16	106	
R.R. car and truck load	68	77	
Workers examined			
Number in group	39	35	
Age (yr) mean	45.9	49.1	N.S.
range	34-75	29-67	
Exposure (yr) mean	16.2	17.4	N.S.
range	11-22	11-22	
Radiographic findings compatible with pneumoconioses	1 (2.6%)	12 (34.3%)	<0.01
Clinical findings			
Cough	10 (25.6%)	10 (40.0%)	N.S.
Dyspnea	10 (25.6%)	22 (62.9%)	<0.01
Lung crepitations	2 (5.1%)	8 (22.9%)	<0.05
Clubbing	0	7 (20.0%)	
Smokers	19 (48.7%)	23 (65.7%)	N.S.

* The dust count data represent mean dust concentrations over 20-yr periods.

TABLE 5
COMPARATIVE DUST COUNTS AND FIBER COUNTS IN THE TWO PLANTS

	Present plant data obtained in 1970		Comparative plant data obtained in 1969	
	Dust count (mppcf)	Fiber count (fibers > 5 μ m/ml)	Dust count (mppcf)	Fiber count (fibers > 5 μ m/ml)
Mine				
Drilling	7	8	16	371
Dragline loading	10	11	— ^a	—
Tramming & mucking	11	22	2	62
Primary crushing	48	260	—	—
Hoist loading	14	29	—	—
Mill				
Secondary crushing	13	13	19	112
Grinding (Wheeler)	19	30	21	84
Grinding (Hardinge)	8	33	—	—
Bagging	8	30	12	135
Palletizing	6	27	—	—
Bulk loading	10	8	—	—
R.R. car and truck loading	—	—	70	198

^a (—) Not done.

graphic data compiled from a previous study made 6 yr earlier in another talc mining and milling plant in the same regional area are shown in Table 4. Table 5 shows the comparative dust and fiber counts in the two plants; the counts in the present plant study were taken in 1970 and those at the comparative plant were taken in 1969. A flow sheet of the mining and milling operations in the plant most recently studied is shown in Fig. 1.

Mineral analysis of talc samples. Optical, x-ray, electron microscopic and electron microprobe examination of the talc samples taken from the plant studied most recently indicated that the true mineral talc, as defined mineralogically, is only one of many mineral components in the materials mined, milled and sold as commercial talc and that it is present as either a major or minor component. The asbestiform minerals tremolite and anthophyllite may constitute major fractions of commercial talc. Figures 2, 3 and 4 show the various constituents of the dust samples as viewed under plane polarized light (Fig. 2) and electron microscopy (Figs. 3 and 4).

DISCUSSION

A correlation of the clinical and environmental findings noted in Table 1 shows that in spite of a mean exposure of 16.2 yr with a range of 11–22, only one individual showed a chest roentgenogram consistent with pneumoconiosis. This occurred in a 75-yr-old individual who had a nonproductive cough, Grade 1 dyspnea and who worked as a janitor for 11 yr. Although the absence of positive roentgenographic shadows does not conclusively exclude the presence of pneumoconiosis

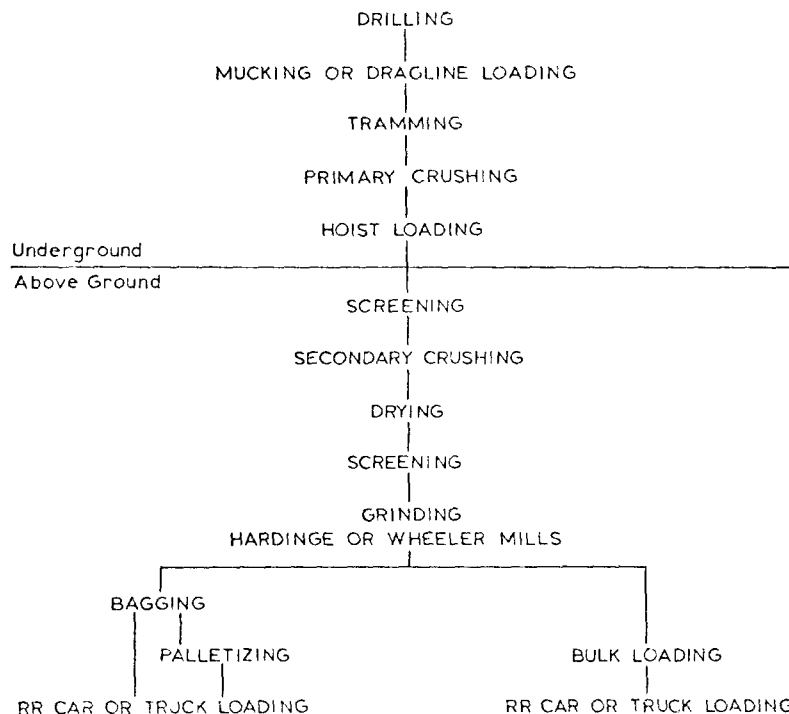


FIG. 1. Flow chart of commercial talc mining and milling operations in the plant studied.

in the other individuals who had positive clinical findings, it makes the presence of pneumoconiosis less likely. Usually the criteria for asbestotic pneumoconiosis is a history of prolonged exposure coupled with positive roentgenographic shadows and a restrictive breathing disorder. When the clinical data on the workers was compared with the control group (Table 1), there was no appreciable difference in the presence of cough or lung crepitations, the only difference being in the number of people with dyspnea and its severity. In the control group there were three individuals who had dyspnea which was categorized as Grade 1. Of the nine individuals in the study group with dyspnea, six showed Grade 1, one showed Grade 2 and two showed Grade 4. Of the two with Grade 4 dyspnea, one was a cardiac who had sustained a myocardial infarction and the other had pulmonary emphysema prior to his employment. These two individuals were heavy smokers, one having smoked two packs daily for over 20 yr and the other two packs daily for a period of 31 yr. Hence, the element of smoking must be included as an important etiologic factor. Although the dyspnea in these two individuals was not primarily related to their occupational exposure, it may very well have been that their prolonged exposure to the commercial talc dust acted as an additional causal element. By and large, as shown in Table 2, there was no good correlation between dyspnea and cough when related to age, smoking habits and duration of exposure.

In order to obtain some information on the dose-response relationship, it was

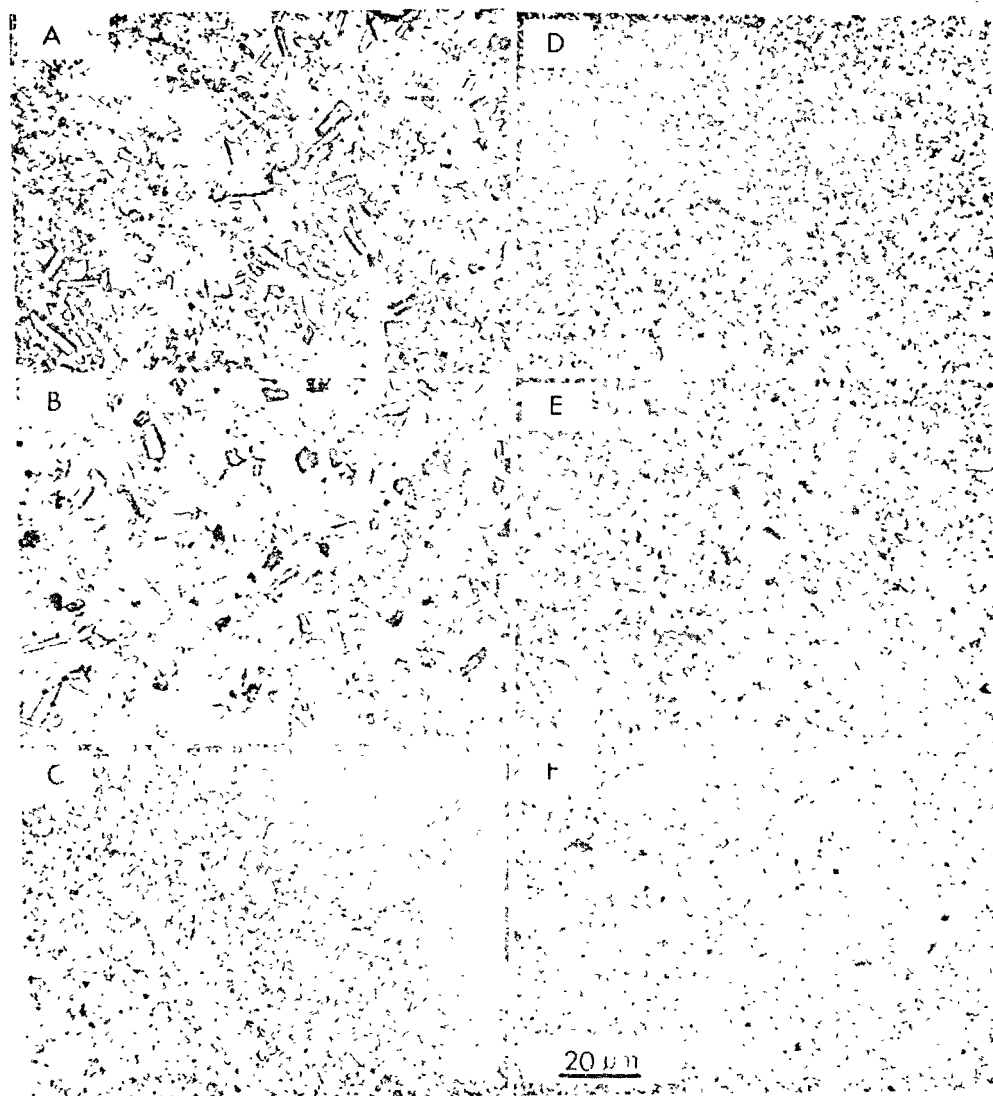


FIG. 2. Talc samples as viewed in plane polarized light. All magnifications are as shown in (F). Sample (A), a primary crushing area, (B), drilling area, (C), mill, (D), talc "N200L"; (E), talc "N200", (F), talc "N300." These samples represent materials from source to end-product. In addition to the mineral species, rock fragments were observed in the first three samples.

possible to compare a group of 35 individuals of the plant studied earlier (Table 4) who were of the same age and range and who had a similar mean duration of exposure as well as range but whose degree of exposure in terms of total particle counts was appreciably greater than those in the plant recently studied as shown in Tables 4 and 5. As would be expected, the group exposed to higher dust concentrations and fiber counts showed a significantly increased prevalence

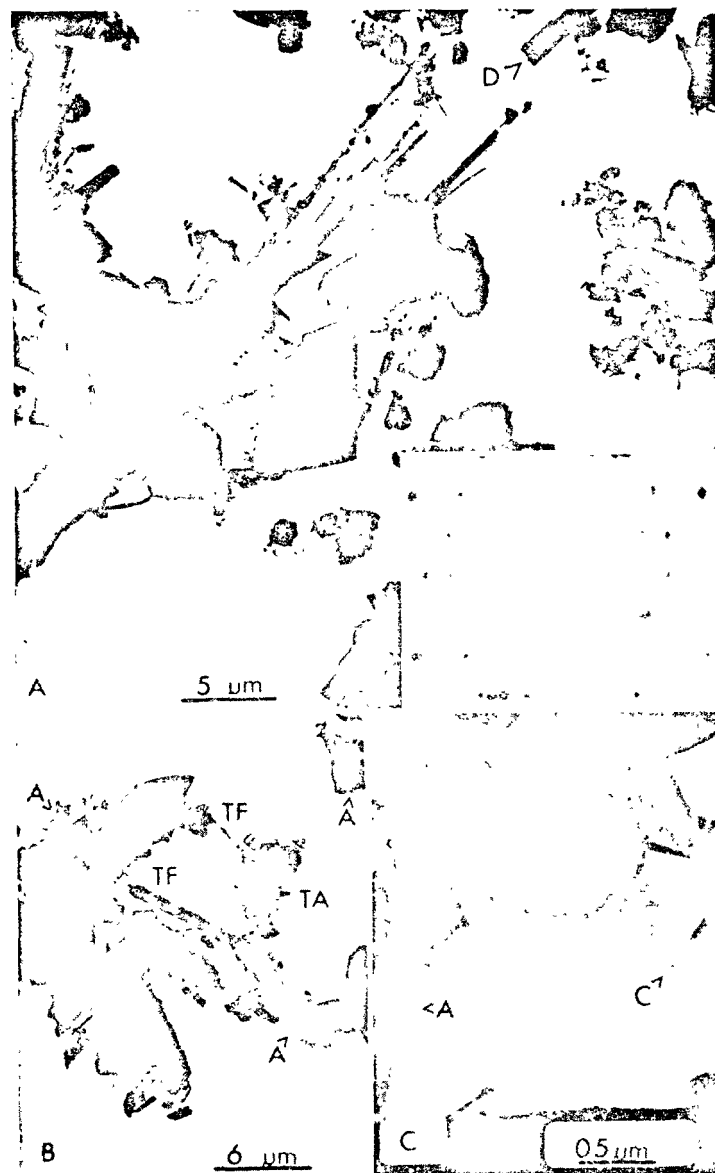


FIG. 3. Amphibole fibers present in talc. This sample was examined for amphibole fibers and electron diffraction patterns obtained on selected fibers (3A; insert 3A). The structural array is clearly different than that obtained on talc fibers. 3B shows the presence of talc fibers (TF), amphibole fibers and fragments (A), and the presence of talc aggregate grains (TA). 3C shows a chrysotile (C) fibril and an amphibole (A) fiber admixed in the talc.

of positive chest roentgenographic findings consistent with pneumoconiosis as well as more positive clinical findings.

In both talc plants there was no correlation between the fiber count and mean dust counts indicating the desirability of utilizing both total particle concentra-

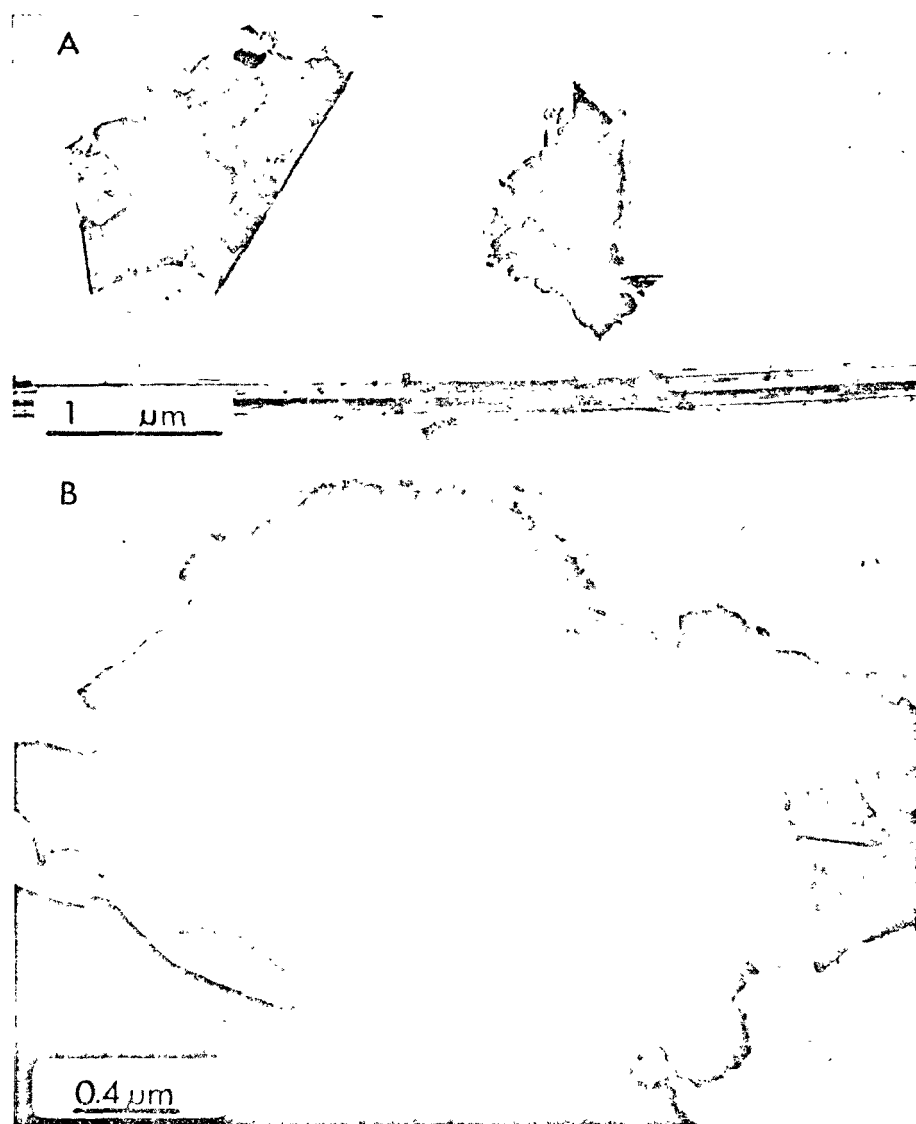


FIG. 4. Talc aggregate grains as viewed with transmission electron microscopy. These grains are apparently intergrowths of true talc, talc fibers, serpentine minerals and after fragments, and amphibole fibers and fragments. (A) These grains appear to survive the milling operations as entities. Particles making up the grain may range from several thousand to several hundred angstroms in size. (B)

tion as well as fiber counts when one correlates the environmental and clinical data. Table 3 shows the lack of correlation between the two indices in the present plant studied. There is at present no conclusive data that it is the fiber per se which is solely responsible for producing both the fibrotic and malignant changes. In addition, the effect of periodic exposures of short duration to high concentrations of fibers and particles or peak concentrations needs further study and clari-

fication. One should therefore consider the particle concentration, fiber count and their peak values in establishing threshold limit values. Furthermore, the nature of the samples analyzed indicates that fiber counts of aerosols may not provide a true picture of exposure to asbestiform minerals because the fiber counts include talc fibers but exclude many small asbestos fibers and "aggregate fibers" which may contain substantial amounts of asbestiform minerals (Fig. 4). Suzuki and Churg (11) have suggested that it is the submicroscopic fibers that are responsible for most of the biologic effects produced by asbestos. Other investigators (6, 12) have also pointed out that the fine dust particles below 1 μ m in length may be just as damaging as dust containing both large and small particles.

In a recent paper by Murphy and associates (13) on workers exposed to chronic low concentrations of asbestos dust in ship construction wherein the asbestos used was principally chrysotile and amosite, the authors reported that they did not find any evidence of asbestosis in persons with less than ten years of cumulative exposure. No information on peak exposures was given. The periodic peak exposures may be the more important factor relating to the fibrogenic effect. These authors, however, observed that there was a progressive increase in prevalence of asbestotic pneumoconiosis with the years of exposure thereafter. In terms of time weighted averages, Murphy and associates (13) found no asbestosis in men exposed less than 60 mppcf-years. Although it is difficult to compare their work with the present study, it does nevertheless appear that while an appreciable number of workers in the present study exceeded the 60 mppcf-years, they did not show any evidence of pneumoconiosis, as determined by the criteria of Murphy and associates. It is possible that, in terms of a fibrogenic response, tremolite and anthophyllite are less pathogenic than chrysotile or amosite at the degrees and intensity of dust exposures present in this study.

In terms of the present findings, the data are not sufficiently conclusive for carcinogenicity for it has been shown that the occurrence of malignancy requires a longer elapsed time from onset of exposure. Since the start of its operations, the longest exposure in the plant studied was only 22 yr and the occurrence of malignancy from commercial talcs containing tremolite and anthophyllite in addition to talc has not infrequently required a longer duration or a greater elapsed time from initial exposure as was shown in an earlier study (14). None of the insulation workers studied by Selikoff and Hammond (15) died from carcinoma of the lung, mesothelial tumors or asbestosis before 20 years had elapsed since first exposure. To date, no instances of malignancy have occurred in any of the workers exposed exclusively to commercial talc at the plant studied.

SUMMARY AND CONCLUSIONS

A clinical and environmental study was made of a group of 39 workers exposed to commercial talc dust, of which tremolite and anthophyllite were the major fibrous components. The clinical findings were compared to those obtained from a control group. The data showed that in spite of a mean exposure of 16.2 yr with a range of 11-22, only one of the workers exposed to commercial talc dust showed a chest roentgenogram consistent with pneumoconiosis. When the clinical

data on the workers was compared with the control group, the only significant difference was in the number of people having dyspnea and its severity. Two individuals had severe dyspnea. One of the two had a cardiac condition and the other had primary pulmonary disease prior to his employment. Both were heavy smokers for over 20 yr. The authors considered both the element of smoking and the exposure to commercial talc as aggravating factors which accounted for the dyspnea. The findings of the 39 workers in the present study were compared to those obtained from 35 workers studied earlier in another talc plant. Both groups had similar mean durations of exposure to commercial talc but the degree of exposure of the group of 35 was appreciably greater. In the group previously studied there was a significantly increased prevalence of positive roentgenographic findings consistent with pneumoconioses as well as more positive clinical findings. In the present study where the mean exposure was 16.2 yr with a range of 11–22, no instance of malignancy occurred in any of the workers exposed exclusively to commercial talc. It is possible that commercial talc containing tremolite and anthophyllite as major fibrous constituents may be less fibrogenic than chrysotile or amosite at the degrees and duration of dust exposure present in this study.

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Mortality Experiences Among Talc Workers: A Follow-up Study

M. Kleinfeld, M.D., J. Messite, M.D.
and M. H. Zaki, M.D.

In an earlier study of talc workers who had 15 or more years of exposure to commercial talc dust, the authors found that the proportional mortality from carcinoma of the lung and pleura among these workers was four times that of the general population. However, the significant increase in incidence of malignancy appeared in the older talc workers, namely, the 60 to 79, rather than in the 40 to 59 year age group.¹ This observation in the talc workers was at variance with those found in a group of asbestos insulators who had the same duration of exposure covering a similar time period.² The asbestos insulators showed an increased incidence of mortality from lung cancer in both age categories. The incidence of carcinoma of the gastrointestinal tract and peritoneum among the talc workers was not significantly different from that of the general population, whereas among the asbestos insulators the incidence of gastrointestinal malignancy was significantly higher. The authors postulated that the earlier occurrence of malignancies among the asbestos insulators was due to two factors. The first was the relatively greater carcinogenicity of the chrysotile asbestos as compared to commercial talc. The second factor was the exposure of the insulators to greater quantities of chrysotile asbestos as compared to the talc workers who were exposed to lesser quantities of talc dust which was admixed with appreciable amounts of tremolite and anthophyllite

asbestos. The earlier study¹ also showed an increased incidence of deaths due to talc pneumoconiosis and/or its complications. The present study was designed to bring the mortality data among the talc workers up to date and to provide additional information not reported in the earlier study.

Materials and Methods

All the talc workers employed in 1940 who had accumulated 15 or more years of exposure to commercial talc dust as well as those who achieved a minimum of 15 years of such exposure between 1940 and 1969 were included in the study. The group totaled 260 workers and it is believed that the overall number constituted the total work force in the worker population under study.

Source of Data.—The data were obtained from a number of sources. Plant records were examined and the work history of each individual was detailed to include changes of job and specific years of employment. Death certificates were studied in all instances where they were available. The records of the physicians who had attended the workers privately were reviewed. Substantial medical information on the majority of the workers was available in the Division's files which were used as an additional source of data. Hospital records, including autopsy reports and histological specimens, were examined wherever available. Autopsy or biopsy records were obtained in 38 of the 108 deaths.

Statistical Analysis.—The causes of death included the following malignancies, cardiac diseases other than cor pulmonale, pneumoconiosis and its complications, accidents or suicides,

and all other causes. In view of the limitations of the available data, a study of the mortality experience by person years of exposure was not feasible. As an alternate, a comparison was made of the observed proportional mortality rates from the specific causes with the expected rates among similar population groups and was found satisfactory for a descriptive study of this nature. The proportions of observed mortality attributed to cancer of the lung and pleura and of the gastrointestinal tract and peritoneum and cardiac diseases were compared to the expected mortalities due to the above causes in the various age groups. The expected mortality for the total group represents the proportion of deaths among white men in the United States due to the specific causes in the year 1955. This particular year was chosen as standard because it is the median year of death among the 108 deaths. For each of the 5-year periods the median years, namely, 1942, 1947, 1952, 1957 and 1962 were selected. Differences between observed and expected frequencies were tested for significance using the normal curve for large numbers and the Fisher's exact probability test for small frequencies.

Findings

Total Deaths.—There were 108 deaths in the group of 260 talc workers. The causes of death in the various categories are shown in Table 1. A distribution of the deaths according to age group appears in Table 2. The average age at death of the 108 talc workers was 60.3 years, with a range of 38 to 84 years. Table 3 shows cause of death and the number of deaths during each 5 year period from 1940 to 1969.

From the New York State Department of Labor Division of Industrial Hygiene and the State University of New York, Downstate Medical Center, Brooklyn, N.Y.

Reprint requests to Dr. Kleinfeld, 403 Ocean Parkway, Brooklyn, N.Y. 11218.

Table 1. — Causes of Death in 108 Talc Workers
During Period of 1940 to 1969

Cause of Death	No.	%
Malignancies	25	23.1
Lung and Pleura	13	12.0
Gastrointestinal and peritoneal	9	8.3
All Other Malignancies	3	2.8
Cardiac Deaths (other than cor pulmonale)	30	27.8
Pneumoconiosis and Complications	29	26.9
Accidents or Suicides	8	7.4
All Other Causes	16	14.8
Total	108	100.0

Malignancies.—Deaths from cancer of the respiratory tract and gastrointestinal tract and observed and expected proportional mortality rates are shown in Table 2. Twelve of the 13 malignancies of the lung and pleura were carcinomas of the lung and 1 was a fibrosarcoma of the pleura. Of the 9 malignancies of the gastrointestinal tract and peritoneum, 3

were cancers of the stomach; 2 were cancers of the liver, 1 of which was a primary hepatoma of the liver and the other a metastasis from a gastrointestinal malignancy, 1 was a cancer of the colon; 2 were cancers of the pancreas; and 1 was a peritoneal mesothelioma. The 3 malignancies involving other sites included 1 retroperitoneal reticulum cell

carcinoma, 1 chronic lymphatic leukemia and 1 Hodgkins' disease. The observed deaths and expected proportional mortality from cancer of the lung and pleura and of the gastrointestinal tract and peritoneum during the 5-year periods extending from 1940 to 1969 are shown in Table 4

Cardiac Deaths.—Of the 30 cardiac deaths, excluding cor pulmonale, 22 had coronary artery disease, 5 had hypertensive heart disease and 3 had rheumatic heart disease. Table 2 shows the deaths and proportional mortality from cardiac disease related to specific age groups and Table 5 gives a breakdown of the number of deaths from cardiac disease during the specified 5-year periods.

Pneumoconiosis and its Complications.—There were 29 deaths in this group. Twenty of the 29 were due to cor pulmonale, 5 to advanced tuberculosis and 4 to bronchopneumonia. The lapsed time from the first talc ex-

Table 2. — Deaths and Proportional Mortality from Carcinomas of the Respiratory Tract, of the Gastrointestinal Tract, and From Cardiac Diseases Among Talc Workers by Age, 1940-1969

Age Group	Total Deaths	Deaths and Proportional Mortality From Respiratory Carcinomas (%)			Deaths and Proportional Mortality From Gastrointestinal Carcinomas (%)			Deaths and Proportional Mortality From Cardiac Diseases (%)		
		No.	Observed	Expected	No.	Observed	Expected	No.	Observed	Expected
< 40	3	0	0	1.6	0	0	2.5	1	33.3	21.1
40-59	47	4	8.5	5.2	3	6.4	5.7	11	24.4	44.2
60-79	54	9	16.6	3.6	4	7.4	7.2	17	31.5	47.8
80-84	4	0	0	1.1	1	25.0	5.3	1	25.0	47.1
Total	108	13	12.0	3.7	8	7.4	6.5	30	27.8	45.8

Table 3. — Causes of Death in 108 Talc Workers*
During the Period 1940-1969

Cause of Death	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69	Total
Malignancies							
Lung and Pleura	—	2	1	5	3	2	13
Stomach	—	1	—	1	—	1	3
Liver	1	—	—	1	—	—	2
Colon	—	—	1	—	—	—	1
Pancreas	—	—	—	—	1	1	2
Peritoneum	—	—	—	1	—	—	1
Other Malignancies	—	—	2	—	—	1	3
Cardiac Diseases	3	6	—	6	8	7	30
Pneumoconiosis and Complications	2	4	2	8	9	4	29
Accidents and Suicides	1	1	1	2	2	1	8
Others	—	3	1	1	5	6	16
Total	7	17	8	25	28	23	108

* who had at least 15 or more years of exposure to talc dust.

Table 4. — Deaths and Expected Mortality from Cancer of the Lung and Pleura and of the Gastrointestinal Tract and Peritoneum Among Talc Workers 1940-1969

	Lung and Pleura			Gastrointestinal Tract and Peritoneum		
	Deaths	Proportional Mortality (%)		Deaths	Proportional Mortality (%)	
		Observed	Expected		Observed	Expected
1940-44	0	0	2.0	1	14.3	7.8
1945-49	2	11.7	3.1	1	5.8	7.8
1950-54	1	12.5	4.3	1	12.5	7.1
1955-59	5	20.0	5.7	3	12.0	6.7
1960-64	3	10.7	6.7	1	3.6	6.3
1965-69	2	8.7	7.7	2	9.5	6.1
Total	13			9		

posure to death in this group averaged 30.9 years, with a range of 15 to 46 years. All 29 had their initial exposures prior to 1945 at which time more effective engineering controls, including wet drilling in the talc mines, were introduced.

All Other Causes. — In addition to 8 accidents and suicides, there were 16 additional deaths in this category. Three were due to cerebrovascular accidents, 4 to pneumonia, and the remaining 9 to one of the following causes: bleeding duodenal ulcer, strangulated inguinal hernia, perforated diverticulum with peritonitis, acute glomerulonephritis, mesenteric arterial occlusion, intestinal obstruction, uremia, and gunshot wounds.

Environmental Exposure. — Environmental exposure data was available in 97 of the 108 death cases. The mean duration of exposure for this group was 24.1 years, with a range of 15 to 47 years. The dust exposure was predominantly to talc, tremolite, anthophyllite, carbonate dusts and a small amount of free silica. Comparative dust counts at the talc mines and mills prior to 1945 and between 1946 and 1969 are shown in Table 6. Table 7 shows the deaths from respiratory and gastrointestinal malignancy, cardiac disease and from all causes among the talc workers by years of exposure to commercial talc dust.

Comments

Malignancies. — The data on carcinoma of the lung and pleura show the overall proportional mortality to be approximately four times that expected. Consistent with our previous observation¹ a significant increase appears to occur in the age group of 60 to 79

years rather than in the 40 to 59 year age group. As has been mentioned, this finding among talc workers is at variance with what the authors have observed among asbestos insulators where the observed values in both the 40 to 59 and 60 to 79 year age group were significantly different from the expected values. Kiviluoto and Meurman³ also reported the occurrence of lung cancer among younger anthophyllite miners (45-54 year age group) who had more than 10 years of exposure, with a mean of approximately 20 years, to pure anthophyllite asbestos. Two explanations are offered. One is that the mixed dust to which the talc workers were exposed, namely, talc, tremolite and anthophyllite, is less carcinogenic than chrysotile dust to which the asbestos insulators were exposed. The second is that the talc workers were exposed to a lesser concentration of dust compared to the asbestos insulators and anthophyllite miners. One or both of these factors may account for the difference in the mortality experience of the talc and asbestos workers groups. In the absence of adequate smoking data, one cannot

assess the role played by smoking in accounting for the differences in the occurrence of malignancies.

When carcinoma of the lung and pleura are related to each of the six 5-year periods, as shown in Table 4, it is noteworthy that the observed proportional mortality from carcinoma of the lung was approximately four times as much as the expected mortality during the years 1945 to 1959 and dropped to approach the expected mortality in 1960-64 and 1965-69. The differences between the observed and expected mortality rates were significant in 1950-54 ($P < 0.01$) and insignificant in 1960-64 and 1965-69 ($P > 0.05$). The improved mortality experience between 1960 and 1969 in the case of lung and pleural cancers is particularly pertinent since environmental controls have resulted in an appreciable reduction in the dust counts in the mines and mills, although the fiber counts still remain high (Table 6). This finding indicates that the present threshold limit for tremolite and anthophyllite needs reevaluation.

With regard to cancer of the gastrointestinal tract and peritoneum among the

Table 5. — Deaths and Expected Mortality From Cardiac Disease Among Talc Workers 1940-1969

	Deaths	Proportional Mortality (%)	
		Observed	Expected
1940-44	3	42.8	37.4
1945-49	6	35.3	41.0
1950-54	0	0	46.0
1955-59	6	24.0	46.5
1960-64	8	28.6	46.6
1965-69	7	30.4	45.5
Total	30		

Table 6. — Comparative Dust and Fiber Counts at the Various Talc Mining and Milling Operations

	Pre 1945 through 1969						1972		
	Dust Counts*						Dust Counts*	Fiber Counts*	
	Pre 1945		1946-1965		1966-1969				
	Ave.**	Med.**	Ave.**	Med.**	Ave.**	Med.**	Ave.**	Med.**	
Drilling	818	413	5	3	19	19	7	7	3
Mucking	120	30	5	5	9	9	3	3	2
	Pre 1948		1948-1965						
Crushing	180	69	42	13	28	20	35	15	62
Screening	69	61	37	37	—	—	—	—	—
Milling	92	75	25	20	40	24	7	7	25
Garnering & Separating	278	70	27	27	—	—	13	9	27
Pulverizing	—	—	28	28	—	—	—	—	—
Bagging	151	129	27	23	29	25	27	27	47
RR & Truck Loading	—	—	73	63	43	20	36	28	24
Blow Room***	1227	1196							
Open Chutes***	125	83							

* Dust counts in mppcf, fiber counts in no. fibers/ml. > 5μ in length

** Ave. - average, Med. - median

*** Operation discontinued after 1948

talc workers, we did not find any significant difference between the observed and expected values in the overall and specific age groups studied. Nor did Kiviluoto and Meurman find an increased incidence of gastrointestinal cancer among the anthophyllite workers they studied.³ These findings differ from those observed in asbestos insulators where a significant increase in the observed incidence of gastrointestinal malignancy was found in the overall and specific age groups studied.¹ Our findings among asbestos insulators were similar to those reported by Selikoff, Hammond and Churg.⁴

Deaths Due to Pneumoconiosis and its Complications.—A previous study has shown that cor pulmonale is a major complication of talc pneumoconiosis

and is a major cause of death among talc workers.¹ The findings in this study confirm the previous report. However, as shown in Table 3, the percentage of deaths due to pneumoconiosis and its complications has decreased by more than 50% in the last 5-year period studied (1965-69) as compared to the preceding period. The number of deaths probably reflects the greater exposures which occurred in the earlier years of employment. A longer interval must elapse, however, before the effect of controls on the incidence of pneumoconiosis can be appraised more definitively in the plant studied. In another study of a different plant⁵ processing a similar mixture of talc, tremolite and anthophyllite but wherein controls were installed at the inception

of operations in 1948, only one of 39 workers had a chest roentgenogram consistent with pneumoconiosis. The mean exposure of the 39 workers was 16.2 years with a range of 11 to 22 years. The worker whose chest roentgenogram was consistent with pneumoconiosis was a 75-year old man who had a non-productive cough, a Grade 1 dyspnea and who worked as a janitor for 11 years. The low incidence of pneumoconiosis was found despite the presence of relatively high fiber and dust counts. The fiber counts exceeded by 2 to 6 times the present threshold limit value of 5 fibers/ml with a length greater than 5 microns. In terms of time weighted averages, Murphy and associates⁶ found no asbestosis among workers exposed less than 60 mppcf-

Table 7. — Deaths From Respiratory and Gastrointestinal Malignancy, Cardiac Disease and From All Causes Among Talc Workers by Years of Exposure to Talc Dust

Cause of Death	Exposure in Years						Unknown	Total
	15-19	20-24	25-29	30-34	35-39	40+		
Malignancy of the Respiratory Tract	3	7	1			1	1	13
Malignancy of the Gastrointestinal Tract	2	4	1	1	2	1	1	9
Cardiac Disease	9	8	4	2	2	1	4	30
All Causes	24	35	15	12	6	5	11	108

years to chrysotile and amosite in the construction. In the study of the plant having controls since the start of operations, it was found that an appreciable number of workers exceeded the 60 mppcf-years, but did not show any evidence of pneumoconiosis as determined by the criteria of Murphy and associates. The authors⁵ concluded from the study of the plant having controls from the outset of operations that tremolite and anthophyllite were less fibrogenic than chrysotile or amosite at comparable dust exposures.

Deaths from Cardiac Disease. — Rather surprising was the observation that the observed proportional mortality from cardiac disease was lower than the expected mortality in all 5-year periods except the first, namely, 1940-1944 (Table 5). No valid conclusion could be drawn regarding this period since the authors could find records of only 3 deaths in the period 1940-1944. However, it seems reasonable to state on the basis of the remaining data that the overall observed proportional mortality from cardiac disease among talc workers was lower than the expected mortality. The decreased mortality from cardiac disease among talc workers cannot be attributed to a predisposition to lung cancer which generally results in the death of these workers at earlier ages before they might be expected to succumb to cardiac disease. As Table 2 demonstrates, the decreased proportional mortality from cardiac disease is present in both the 40

to 59 as well as the 60 to 79 year age group. If malignancy of the lung was a factor, one would have expected a difference in incidence between these two age groups. Deaths in the age group under 40 and 80 to 84 are too few to warrant any comments with regard to cardiac disease. The true explanation is open to conjecture. The rural environment in which the talc workers lived, as well as the possibility that they smoked less, may account for the lower mortality due to cardiac disease as compared to the national rate.

Correlation of Malignancy with Age and Years of Exposure. — The data shown in Table 7 indicate that the majority of the malignancies of the respiratory tract occurred in the workers exposed 15 to 24 years. During this period 10 of the total of 13 died from malignancy of the respiratory tract. In this group the elapsed time from onset of exposure to death was similar to the duration of exposure. The finding suggests that the carcinogenic effect of the commercial talc dust is manifested mainly after exposure of 15 to 24 years and that very prolonged exposure, 25 years plus, does not appear to carry with it a significantly increased risk for cancer production. One plausible explanation is that a more susceptible group will develop cancer between 15 and 24 years and that after 24 years there is a group which is relatively less susceptible to cancer production in spite of added years of exposure. However, confirmative findings in the study of a larger

group are needed to validate this explanation. With regard to malignancy of the gastrointestinal tract, the deaths were distributed over all periods of exposure. The small number of deaths does not lend itself to provide any conclusion regarding the risk of developing malignancy in the gastrointestinal tract and years of exposure. With regard to deaths from cardiac disease, Tables 5 and 7, there does not seem to be any difference regarding the years of exposure and the exposure pattern in the total group.

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Title 30—Mineral Resources

CHAPTER I—BUREAU OF MINES,
DEPARTMENT OF THE INTERIORSUBCHAPTER II—METAL AND NONMETALLIC
MINESPART 55—HEALTH AND SAFETY STANDARDS—METAL AND NONMETALLIC
OPEN PIT MINES

Miscellaneous Amendments

Pursuant to the authority vested in the Secretary of the Interior under section 6 of the Federal Metal and Nonmetallic Mine Safety Act (30 U.S.C. 725) to develop, revise, and promulgate health and safety standards for metal and nonmetallic mines, there was published on Wednesday, August 29, 1973, a notice of proposed rulemaking in the *Federal Register* (38 FR 23303 and 23304), to amend Part 55, Subchapter II, Chapter I, Title 30, Code of Federal Regulations, by revising and revoking certain standards currently in force and by adding new standards. Each of the standards contained in the notice was developed or revised after consultation with the Federal Metal and Nonmetallic Mine Safety Advisory Committee appointed pursuant to section 7 of the Act (30 U.S.C. 726).

The notice further provided that each proposed standard which is to be a mandatory standard was so designated by the word "Mandatory" which appeared at the beginning of the standard and if a standard had been recommended by the Federal Metal and Nonmetallic Mine Safety Advisory Committee such standard was identified by the letters "MINESAC." Under the provisions of subsection 6(e) of the Act (30 U.S.C. 726) a standard recommended by the Advisory Committee was not subject to hearings.

Subject to the provisions of subsection 6(e) of the Act and in accordance with the provisions of subsection 6(f) (30 U.S.C. 726(f)) on or before the last day of the period fixed for the submission of written data, views, or arguments, any person who may be adversely affected by a proposed standard which had not been recommended by the Federal Metal and Nonmetallic Mine Safety Advisory Committee was afforded an opportunity to file with the Secretary of the Interior written objections thereto stating the grounds for such objection and requesting a public hearing (Subject to the Administrative Procedure Act) on such subject.

Interested persons were requested to submit written data, views, arguments and requests for hearings to the Administrator, Mining Enforcement and Safety Administration (MESA) on or before October 15, 1973. No hearings were requested on the proposed standards which were designated as "Mandatory" by the Secretary of the Interior, and all of the data, views and arguments received concerning the standards were given careful consideration.

The comments and recommendations received indicated support for the standards which are promulgated below. Promulgation of the proposed revision to standard 55.19-24 (38 FR 23304) con-

cerning wire rope attachments has been deferred so that the Department may undertake additional review, study and analysis of such changes prior to taking further action. With respect to the standard 55.5-1 (38 FR 23303) As a result of these comments the following changes are made:

Standard 55.5-1. (a) Editorial changes have been made in paragraphs (a) and (b) to clarify the requirements of these provisions; and

(b) The Time-Weighted Limit Values published in the 1972 edition of the American Conference of Governmental Industrial Hygienists publication have been updated to the Conference's 1973 edition which supersedes and replaces the 1972 edition; and

(c) An 8-hour time weighted average exposure of personnel to airborne concentrations of asbestos dust has been specified in paragraph (b); and

(d) The term "asbestos" as used in paragraph (b) is defined to include only chrysotile, amosite, crocidolite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos, or those minerals which are essentially known as asbestos minerals. The latter three minerals use the word asbestos because the same mineral name is used for both the asbestiform and non-asbestiform varieties of these minerals. Tremolite of a non-asbestiform which occurs in talc deposits is not mentioned in the definition and, therefore, is not covered.

Note. On May 8, 1973 a public symposium was held in Washington, D.C. to receive data on talc deposits in the metal and nonmetallic mining industries (see 38 FR 23304). Much data based on both human and animal studies were presented. This data supported the opinion that talc dust with tremolite and/or anthophyllite as chrysotile or other true asbestos minerals. The Mining Enforcement and Safety Administration and the National Institute of Occupational Safety and Health are planning a joint study to determine the toxic nature of talc and tremolite dust exposure. Pending the results of this study both fibrous talc and tremolite (non-asbestiform) are subject to the adopted threshold limit values under paragraph (a) of this standard (see page 13 of the Conference's 1973 publication).

(e) Paragraph (b) is further revised to provide the allowable peak or ceiling concentration of asbestos fiber. This ceiling concentration is 10 fibers longer than 5 micrometers, per milliliter of air, as determined by the membrane filter method over a sampling time of 15 minutes.

Effective date. The amendments, revisions and revocation of standards, and new standards shall become effective on July 1, 1974.

Part 55 of Chapter I of Title 30 of the Code of Federal Regulations is amended as set forth below:

(Sec. 6, Federal Metal and Nonmetallic Mine Safety Act; 30 Stat. 772; (30 U.S.C. 725))

Dated: June 26, 1974.

C. K. MALLORY,
Deputy Assistant Secretary
of the Interior.

Part 55, Title 30 Code of Federal Regulations is amended and revised as follows:

§ 55.5 [Amended]

1. Standard 55.5-1, promulgated on December 3, 1970 (35 FR 18387), is revised to read as follows:

55.5-1 Mandatory. Except as permitted by § 55.5-5:

(a) Except as provided in paragraph (b), the exposure to airborne contaminants shall not exceed, on the basis of a time weighted average, the threshold limit values adopted by the American Conference of Governmental Industrial Hygienists, as set forth and contained in the 1973 edition of the Conference's publication, entitled "TLV's Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1972," pages 1 through 51, which are hereby incorporated by reference and made a part of this publication may be obtained from the American Conference of Governmental Industrial Hygienists by writing to the Executive Director, P.O. Box 1637, Cincinnati, Ohio 45201, or may be examined in any Metal and Nonmetallic Mine Health and Safety District or Subdistrict Office of the Mining Enforcement and Safety Administration. Exposures above the listed thresholds shall not be of a greater magnitude than is considered as permissible by the Conference.

(b) 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 micrometers in length, as determined by the membrane filter method at 400-450 magnification (4 millimeter objective) phase contrast illumination. No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers longer than 5 micrometers, per milliliter of air, as determined by the membrane filter method over a sampling time of 15 minutes. The term "asbestos" as used in this standard is limited to the following minerals, chrysotile, amosite, crocidolite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos.

(c) Employees shall be withdrawn from an area where there is present an airborne concentration given a "C" designation by the Conference and the concentration exceeds the threshold limit value listed for that contaminant.

2. Standard 55.5-5, promulgated on December 8, 1970 (35 FR 18587), is revised to read as follows:

55.5-5 Mandatory. Control of employee exposure to harmful airborne contaminants shall be, insofar as feasible, by prevention of contamination, removal by exhaust ventilation, or by dilution with uncontaminated air. However, where accepted engineering control measures have not been developed or when necessary by the nature of work involved (for example, while establishing controls or occasional entry into hazardous atmospheres to perform maintenance or fire-fighting), employees may work for reasonable periods of time in concentrations of airborne contaminants exceeding permissible levels if they are protected by appropriate respiratory protective equipment. Whenever respiratory protective equipment is used a program for selection, maintenance, training, fitting, supervision, cleaning, and use shall meet the following minimum requirements:

(a) Mining Enforcement and Safety Administration approved respirators which are applicable and suitable for the purpose intended shall be furnished, and employees shall use the protective equipment in accordance with training and instruction.

(b) A respirator program consistent with the requirements of ANSI Z89.2-1960, published by the American National Standards Institute and entitled "American National Standards Practice for Respiratory Protection ANSI Z89.2-1960," approved August 11, 1969 which is hereby incorporated by reference and made a part hereof. This publication may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018, or may be examined in any Metal and Non-metal Mine Health and Safety District or Subdistrict Office of the Mining Enforcement and Safety Administration.

(c) When respiratory protection is used in atmospheres immediately harmful to life, the presence of at least one other person with backup equipment and rescue capability shall be required in the event of failure of the respiratory equipment.

3. Standard 55.6-5, promulgated on December 8, 1970 (35 FR 18587), is revised to read as follows:

55.6-5 *Mandatory*. Areas surrounding magazines and facilities for the storage of blasting agents shall be kept clear of rubbish, brush, dry grass, or trees (other than live trees 16 or more feet tall), for a distance not less than 25 feet in all directions, and other unnecessary combustible materials for a distance of not less than 50 feet.

4. New standard 55.6-12 is added to read as follows:

55.6-12 *Mandatory*. Prior to exterior repair of facilities for storage of explosives, including blasting agents, all explosives stored within the facility shall be removed and the interior cleaned prior to the exterior repair of such facilities. All explosives stored within the facility shall be removed if there exists a possibility that such repairs may produce a spark or fire. The explosives removed from storage facilities to be repaired shall be placed either in other storage facilities appropriate for the storage of such materials under this section or a safe distance from the facilities under repair where they shall be properly guarded and protected until the repairs have been completed and the materials have been returned to storage within the facilities.

§ 55.8 [Amended]

5. New standard 55.8-6 is added to read as follows:

55.8-6 *Mandatory*. The oxygen intake coupling on jet-piercing drills shall be constructed so that only the oxygen hose can be coupled to it.

6. New standard 55.8-7 is added to read as follows:

55.8-7 *Mandatory*. The combustion chamber of a jet drill stem which has been sitting unoperated in a drill hole shall be flushed with a suitable solvent after the stem is pulled up.

§ 55.12 [Amended]

7. Standard 55.12-32, promulgated on July 31, 1969 (34 FR 12507) is made mandatory and revised to read as follows:

55.12-32 *Mandatory*. Inspection and cover plates on electrical equipment and junction boxes shall be kept in place at all times except during testing or repairs.

§ 55.15 [Amended]

8. Standard 55.15-12, promulgated on February 25, 1970 (35 FR 32511), is revoked.

§ 55.19 [Amended]

9. Standard 55.19-7, promulgated on July 31, 1969 (34 FR 12509) is revised to read as follows:

55.19-7 *Mandatory*. All man hoists shall be provided with devices to prevent over-travel. When utilized in shafts exceeding 100 feet in depth, such hoists shall also be provided with overspeed devices.

10. New standard 55.19-13 is added to read as follows:

55.19-13 *Mandatory*. Where any diesel or similar fuel-injection engine is used to power a hoist, the engine shall be equipped with a damper or other cutoff in its air intake system. The control handle shall be clearly labeled to indicate that its intended function is for emergency stopping only.

11. Standard 55.19-26, promulgated on July 31, 1969 (34 FR 12509) is made mandatory and revised to read as follows:

55.19-26 *Mandatory*. Safety device attachments to hoist ropes shall be selected, installed, and maintained according to manufacturers' specifications to minimize internal corrosion and weakening of the hoist rope.

12. New standard 55.19-109 is added to read as follows:

55.19-109 *Mandatory*. Shaft inspection and repair work in vertical shafts shall be performed from substantial platforms equipped with bannet, or equivalent overhead protection.

13. New standard 55.19-143 is added to read as follows:

55.19-143 *Mandatory*. Horsemen shall examine their hoists and shaft test overtravel, deceleration control, position indicators, and braking mechanisms at the beginning of each shift.

[18 Dec 74-14976 Filed 6-28-74; 8:45 am]

PART 55—HEALTH AND SAFETY STANDARDS—GEM, GEM, AND CRUSTAL STONE OPERATIONS

Miscellaneous Amendments

Pursuant to the authority vested in the Secretary of the Interior under section 6 of the Federal Metal and Nonmetal Mine Safety Act (30 U.S.C. 725) to develop, revise and promulgate health and safety standards for metal and nonmetal mines, there was published on Wednesday, August 23, 1973, a notice of proposed rulemaking in the FEDERAL REGISTER (38 FR 23384-23386), to amend Part 55, Subchapter N, Chapter 1, Title 30, Code of Federal Regulations, by revising and revoking certain standards currently in force and by adding new standards. One of the standards contained in the notice was developed or revised after consultation with the Federal Metal and Nonmetal Mine Safety Advisory Committee appointed pursuant to section 7 of the Act (30 U.S.C. 726).

The notice further provided that each proposed standard which is to be a mandatory standard be so designated by the word "Mandatory" which appears at

the beginning of the standard and if a standard had been recommended by the Federal Metal and Nonmetal Mine Safety Advisory Committee, such standard was identified by the letters "MNMSAC." Under the provisions of subsection 6(e) of the Act (30 U.S.C. 725(e)) a standard recommended by the Advisory Committee was not subject to hearings.

Subject to the provisions of subsection 6(e) of the Act and in accordance with the provisions of subsection 6(d) (30 U.S.C. 725(d)) on or before the last day of the period fixed for the submission of written data, views, or arguments, any person who may be adversely affected by a proposed standard which had not been recommended by the Federal Metal and Nonmetal Mine Safety Advisory Committee was afforded an opportunity to file with the Secretary of the Interior written objections thereto stating the grounds for such objection and requesting a public hearing (subject to the Administrative Procedure Act) on such subject.

Interested persons were requested to submit written data, views, arguments and requests for hearing to the Administrator, Mining Enforcement and Safety Administration (MESA) on or before October 15, 1973. No hearings were requested on the proposed standards which were designated as "Mandatory" by the Secretary of the Interior, and all of the data, views and arguments received concerning the standards were given careful consideration.

The comments and recommendations received indicated a need for the standard which was proposed and a need for clarification of the proposed revision to standard 55.19-24 (38 FR 23386) concerning wire rope attachments. It was deferred to that the Department may undertake additional review, study and analysis of such changes prior to taking further action with respect to the standard. Most of the comments received were in response to proposed new standard 55.8-1 (38 FR 23355). As a result of these comments the following changes are made:

Standard 55.5-1 (a) Editorial changes have been made in paragraphs (a) and (b) to clarify the requirements of these provisions; and

(b) The Threshold Limit Values published in the 1972 edition of the American Conference of Governmental Industrial Hygienists publication have been updated to the Conference's 1973 edition which supersedes and replaces the 1972 edition; and

(c) An 8-hour time weighted average exposure of personnel to airborne concentrations of asbestos dust has been specified in paragraph (b); and

(d) The term "asbestos" as used in paragraph (b) is defined to include only chrysotile, amosite, crocidolite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos, or those minerals which are essentially known as asbestos minerals. The latter three minerals use the word asbestos because the same mineral name is used for both the asbestiform and non-asbestiform varieties.

RULES AND REGULATIONS

responsible for promulgating and enforcing occupational safety and health standards and dealing with contested cases, subject to judicial review.

(b) The State program will protect all employees within the State, including those employed by the State and its political subdivisions. Public employees are to be treated the same protection as are afforded employees in the private sector. The State plan does not cover employees of the Federal government or those employees whose working conditions are regulated by Federal agencies other than the United States Department of Labor.

(c) The Wyoming Occupational Health and Safety Act gives the State agency full authority to administer and to enforce all laws, rules, and orders protecting employee safety and health in all places of employment in the State. The legislation provides employer and employee representatives an opportunity to accompany inspectors before or during the physical inspection of any workplace for the purpose of aiding such inspection; adequate safeguards to protect trade secrets; effective sanctions against employers, protection of employees against discharge or discrimination; procedures for prompt removal or elimination of imminent danger situations; the right to review by employers and employees of alleged violations, abatement periods and proper penalties; and prompt notice to employers and employees of alleged violations of standards and abatement requirements.

(d) Administrative regulations include procedures for prompt removal of all pending variances; notice to employers or their representatives when no compliance action is taken as a result of a complaint, including procedures for informal review; information to employees on hazards, pollutants, symptoms and emergency treatment; and training and education programs for employers and employees, including an on-site consultation program consistent with the criteria set out in the Washington Plan decision (38 FR 2121).

(e) The State intends to promulgate Federal standards covering all of the issues contained in Parts 1910 and 1926 of this chapter but will not cover those found in Parts 1915, 1916, 1917, and 1918 of this chapter (ship repairing, ship building, ship breaking, and longshoring). The State also plans to adopt additional vertical standards relating to oil well drilling and servicing not provided by the Federal program. Future Federal standards shall be promulgated by the State within six months after promulgation by the Secretary of Labor. In the case of product standards the State has provided assurances that any State product standards will be required by compelling local conditions and will not unduly burden interstate commerce.

(f) The plan sets out goals and provides a timetable for bringing it into full conformity with Part 1902 of this chapter. All personnel employed to carry out the plan are to be hired under the Wyoming Personnel Merit System which

conforms to standards established by the United States Civil Service Commission. The plan also contains a detailed description of the resources that are to be devoted to it.

§ 1953.341 Where the plan may be inspected.

A copy of the plan may be inspected and copied during normal business hours at the following locations: U.S. Department of Labor, Office of the Associate Assistant Secretary for Regional Programs, Occupational Safety and Health Administration, Room 290, 1726 M Street, N.W., Washington, D.C. 20210; Assistant Regional Director, Occupational Safety and Health Administration, U.S. Department of Labor, P.O. Box 3533, Federal Building, 1661 Stout Street, Denver, Colorado 80202; and the Occupational Health and Safety Department, 200 East 8th Avenue, P.O. Box 2106, Cheyenne, Wyoming 82001.

§ 1953.342 Level of Federal enforcement.

Pursuant to § 1902.20(b) (1) (iii) of this chapter, the present level of Federal enforcement in Wyoming will not be diminished. Among other things, the United States Department of Labor will continue to investigate catastrophes and fatalities, investigate valid complaints under section 302 of the Occupational Safety and Health Act of 1970, continue its target industry and target health programs and inspect a cross section of all industries on a random basis at least until standards are promulgated, the Secretary Administers the Federal Act and the Fair Employment Practices Act are amended and administrative regulations are adopted. Therefore, Federal enforcement activity will continue to the degree necessary to assure occupational safety and health protection to employees in the State of Wyoming, and evaluation of the State plan as implemented, will be made on a continuing basis to assess the appropriate level of Federal enforcement activity.

§ 1953.343 Developmental schedule.

(a) Adoption of Federal standards as State standards by February 1975.

(b) Administrative regulations for recordkeeping and reporting, variances, posting requirements, employee complaint procedures, inspections under the Act, employee exposure to toxic materials, providing information to employees on their exposure to hazards, personal protective equipment, medical examinations, and monitoring, safeguarding trade secrets, administrative review of citations, proposed penalties, and abatement periods, to become effective by June 1, 1974.

(c) Amendment to the Wyoming Administrative Procedure Act to be submitted to the State Legislature January 1975 and to become effective by May 1, 1975.

(d) Management Information System to be completed August 1, 1974.

(e) Manpower staffing for administration of the program to be completed by August 15, 1974.

(f) Amendments to the State's Fair Employment Practices Act to be submitted to the State Legislature which convenes January 14, 1975.

Signed at Washington, D.C., this 25th day of April 1974.

JOHN STENDER,
Assistant Secretary of Labor.

[FR Doc. 74-10206 Filed 5-2-74; 8:45 am]

TITLE 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER C—AIR PROGRAMS

PART 40—STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

Additions and Miscellaneous Amendments

Correction

In FR Doc. 74-4784 appearing at page 9307 as the Part II of the issue of Friday, March 8, 1974, and corrected on page 13776 in the issue of Wednesday, April 17, 1974, on page 13776, "paragraph c." should read as follows:

c. The formula in paragraph (d) should read as follows:

(d) Particulate emission rate shall be determined by:

$C_{PM} = C_{PM} Q$ (Metric or English Units)

where:

C_{PM} = Particulate matter mass emissions, lb/hr (English units); lb/hr.

C = Particulate matter concentration, mg/m³ (English units); lb/dscf.

Q = Volumetric stack gas flow rate, dscf/hr (English units); dscf/hr.

C and Q shall be determined by methods 2 and 3, respectively.

PART 61—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

Asbestos, Beryllium, and Mercury

Pursuant to section 112 of the Clean Air Act, as amended (42 U.S.C. 1857c-7), the Administrator of the Environmental Protection Agency promulgated national emission standards for the hazardous air pollutants asbestos, beryllium, and mercury on April 6, 1973 (38 FR 8320). The subsequent enforcement of these regulations has demonstrated a need for the clarifying revisions which follow. These revisions are necessary to advise the public of how the regulations are being interpreted in Agency enforcement activities. The revisions promulgated herein do not alter the stringency of the regulations.

A change to Subpart A, General Provisions, which applies to all affected sources, is promulgated. The definition of "alternative method" is revised to indicate more clearly that it is not a "reference method" or "equivalent method" and to make the definition consistent with that used in 40 CFR Part 60, Standards of Performance for New Stationary Sources.

officials on floor, bellers, or local support-
 ing clubs or members had to be volun-
 teered and screened off prior to admission.
 The vote of the § 61.22(a)(2)(a) of the
 proposed constitution states that no
 individual or material has to be re-
 moved, but does not specify the proce-
 dure to be used. A statement is added
 to state that it is not necessary for
 material to be removed or taken into
 custody, and that signs, or lead-
 ership material and posters must be
 taken out of the room as they or
 its signs are produced that the use of
 material is not during protest.
 With § 61.22(a)(2)(b) of the
 proposed constitution, it is
 recommended that the following
 be added: "The removal of the
 proposed § 61.22(a)(2)(b) of the

- [illegible]

[illegible][illegible]

The 1990 law finds that good care exists for the processing, handling and information of asbestos-related public information, and the revision made of the law clarifies the rules, but do not change the substance of the national and international standards for asbestos, beryllium and mercury and (2) there is a pressing need to promulgate these revisions so that the proposed standards can be uniformly adopted by industry personnel and enforced by the Agency. Therefore, the Administrator has determined that it is unnecessary to publish a notice of proposed rulemaking or delay the effective date of this amendment either for the reasons or which has not done so.

JOHN QUAGLES,
Acting Administrator.

Subpart A—General Provisions

1. Section 61.02 is amended by revising paragraph (c) to read as follows:

(c) "Alternative method" means any method of sampling and analyzing for an element which is not a reference method or an equivalent method but which has been demonstrated to the Administrator's satisfaction to produce, in specific cases, results adequate for his determination of compliance.

2. Section 61.21 is amended by adding paragraphs (g), (h), (i), and (j). The added paragraphs read as follows:

(g) "Asbestos mill" means any facility engaged in the conversion or any intermediate step in the conversion of asbestos or into commercial asbestos. Outside the area of asbestos materials is not considered a part of such facility.

"Commercial asbestos" means any asbestos which is produced by processing asbestos from asbestos ore.

"Returned" means the commodities imported for use in the production of the commodities covered in commercial importation, other materials, finished commercial products, and the value of this contribution into a commodity (see 19 CFR 101.10).

"Totalitarianism" means the wrecking of the state for any loss of power, or being struck by a disaster.

1. The claim 61.22 is amended by revising (a), (b) (1), (c) (2) (i), and (d) (1), and by adding paragraph (g). The revised and added paragraphs read as follows:

(c) All test cells shall be so constructed as to prevent any gas emissions to the outside air from any test cell except as provided in paragraph (d) of this section.

(1) Written notice of intention to demolish shall be provided to the Administrator by the owner or operator of the demolition operation. Such notice shall be postmarked at least 10 days prior to commencement of such demolition or anytime prior to commencement of demolition subject to paragraph (4) of this section. Such notice shall include the following information:

- (i) Name of owner or operator.
- (ii) Address of owner or operator.
- (iii) Description of the building, structure, facility, or installation to be demolished.
- (iv) Address or location of the building, structure, facility or installation.
- (v) Scheduled starting and completion dates of demolition.
- (vi) Method of demolition to be employed.
- (vii) Procedures to be conducted to meet the requirements of this part.

(c) Plinkable plastic materials, used to maintain or strengthen any element, part, or base supporting the structure, shall be of such material and type as to provide the same structure, strength, or fastening subject to this paragraph, before the kinds of load-spreads or conditions under which it is commonly subjected, and shall be supporting structural members that are in a solid or fibrous condition. The basic material shall not be voids or cracks or in sections without a margin of safety that, except that, the edge border, panel, or load-supporting structural members are cut or disjoined, the material shall be less or materials shall be weaker. The de-activated debris shall be tested adequately to insure that such debris remains wet during all stages of construction and related marine operations.

(4) Any owner or operator of a demolition operation who intends to demolish a building, structure, utility, or installation to which the requirements of this paragraph would be applicable but which has been declared by competent State or local authority to be structurally unsound and which is in danger of imminent collapse is exempt from the requirements of this paragraph other than the reporting requirements specified by paragraph (c)(1) of this section and the removal of friable asbestos debris as specified by paragraph (d)(2)(i) of this section.

on. Where the presence of a concrete material impedes reaching a decision to meet the goals, the decision maker is not of proper mind. This is why the decision maker must first be in the proper state of mind. In the following section, I will discuss the importance of a decision maker's state of mind.

FORM 100-1 (REVISED APRIL 1964)

[illegible]

John C. Carr, Esq.,
and Adm. to Court, &c.

* Authority: Sec. 507(e), Pub. L. 92-500, 86 Stat. 518 (32 U.S.C. 1251 et seq.)

This part may be applicable to investigations and hearings required by section 507(c) of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. (Pub. L. 92-500).

As used in this part, the term:
(a) "Act" means the Federal Water
Pollution Control Act, as amended;

(b) "Effluent limitation" means any effluent limitation which is established as a condition of a permit issued or proposed to be issued by a State or by the Environmental Protection Agency pursuant to section 401 of the Act; any toxic or priority pollutant standard established under section 207 of the Act; any standard of performance established under section 202 of the Act; and any effluent limit or an established under section 302, section 316, or section 313 of the Act.

(c) "Order" means any order issued by the Administrator under section 309 of the Act, any order issued by a State to secure compliance with a permit, or condition thereof, issued under a program approved pursuant to section 402 of the Act, or any order issued by a court in an action brought pursuant to section 309 or section 402 of the Act.

Under "1533" means an employee filing a request under § 1533, any employee actually elected, the employer of any such employee, and the Regional Administrator or his designee.

an "Administrator" or "Regional Administrator" means the Administrator or Regional Administrator of the Environmental Protection Agency.

Any employee who is discharged or laid-off, threatened with discharge or lay-off, or otherwise discriminated against by any person because of the alleged results of any efficient invitation or order issued under the Act, or any representative of such employee, may submit a request for an investigation under this part to the Regional Administrator of the region in which such discrimination is alleged to have occurred.

Upon receipt of any request meeting the requirements of § 105.3, the Regional Administrator shall conduct a full investigation of the matter, in order to determine whether the request may be related to an effluent limitation or order under the Act. Following the investigation, the Regional Administrator shall notify the employee requesting the investigation (or the employee's representative) and the employer of such employee, in writing, of his preliminary findings and conclusions. The employee, the representative of such employee, or the employer may within fifteen days following receipt of the preliminary findings and conclusions of the Regional Administrator request a hearing under this part. Upon receipt of such a request, the Regional Administrator, with