PLAINTIFF'S EXHIBIT

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A S B E S T O S A N D N E O P L A S I A

B Y

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ASBESTOS AND NEOPLASIA

Asbestos is a commercial term which describes about two dozen different types of silicate compounds obtained from serpentine and amphibole rock. Commercial asbestos is a remarkable substance which has strength, flexibility, is resistant to heat, acids, moisture, and is incombustible. These properties account for its ubiquity---it is everywhere. It is found insulating boilers and pipes in buildings,on ships, in every type of refrigeration, in brake linings, textiles, plastics, road and roof surfaces, in paper, and many types of paints. Fibers are even found in beer, soft drinks , and tap water, in parenteral fluids--it is everywhere.

In 1880 a few hundred tons were produced a year compared to 4 to 5 million tons produced now. In 1900 the first case of asbestosis was described. In 1924 it was recognized as an industrial hazard in Great Briton and by the mid 1940's it was becoming evident that not only was it responsible for asbestosis but that 13% of workers with asbestosis were dying not from this lung disease but from lung cancer compared with a 1% death rate from lung cancer in workers with silicosis.

In 1960 Dr Wagner from South Africa reported the occurrence of mesothelioma, a rare tumor type in 2 to 4% of people with asbestosis. Ususally the time of appearance of asbestosis is after 10 years of exposure. The time of appearance of lung cancer is after 20 years of exposure and of mesotheioma after 30-40 years of exposure. More recently various workers, including Selikoff and Hammond in this country have reported an increased incidence of cancers of the G.I. tract as well. Others have reported that laryngeal cancer may also be linked to asbestos exposure.

Although occupational exposure to asbestos fibers with its associated risk for both lung disease (asbestosis) and cancer of the lung and other sites and mesotheliomas of pleura and peritoneum is probobly the most important type of exposure there is now also

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being gathered data which suggest that household contact with asbestos workers and neighborhood comtamination may also be a source of fibers which eventually cause disease in bystanders.

The following tables illustrate the increased cancer risk associated with insulation work:

Table 1 (slide 8)

Table 1 is taken from Selikoff's study of 623 New York-New Jersey asbestos insulation workers who had twenty or more years between first exposure to asbestos and entry into the study. The table compares expected number of deaths (calculated from age specific death rate data of the U.S. National Office of Vital Statistics) with observed number of deaths. The column on the right covers the entire period of the study encompassing the period between 1943-1971. The first three columns cover the deaths between 1943-51, 1952-61, and 1962-71 respectively. For the group as a whole (right hand column) 47.2 deaths from cancer (all sites) would be expected; 189 were found! This is about a four-fold excess of death from cancer. Looking now at lung cancer 10.1 deaths are expected; 84 were found or a risk ratio of 8.3. There were 8 deaths from pleural mesothelioma, 24 from peritoneal mesthelioma whereas these are such rare causes of death that none would be expected in this sample size. 13 deaths from cancers of the stomach, colon, rectum, and esophagus are expected; 41 observed or a risk ratio of 3.2. There were 33 deaths from asbestosis. This table further illustrates the effect of the latent period which is observed between onset of exposure and the appearance of disease. Those deaths which happened between the ealiest period of the study (1943-51) show an overall increased risk of cancer death of "only" 2.5 (11.3 expected; 28 observed) whereas deaths between 1962-71 show a 5.9 risk ratio (17.6 expected; 104 observed). The figure for lung cancer in this group is 9.4 times the expected number of deaths.

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Table 1[a]

Expected[b] and observed number of deaths among 623 New York-New Jersey asbestos insulation workers January 1, 1943-December 31, 1971 twenty or more years after onset of first exposure to asbestos

	1943-51		1952-61		1962-71		Total 1943-71	
	Expected	Observed	Expected	Observed	Expected	Observed	Expected	Observed
Total cancer: all sites	11.3	28 2.5	18.3	57 3.1	17.6	104 5.9	47.2	189 4
Lung cancer	1.5	13 8.7	3.5	23 6.6	5.1	48 9.4	10.1	84 8.3
Pleural mesothelioma	n.a.[c]	1	n.a.	2	n.a.	5	n.a.	8
Peritoneal mesothelioma	n.a.	1	n.a.	3	n.a.	20	n.a.	24
Cancer of stomach, colon, rectum, esophagus	4.1	7 1.7	5.0	18	3.9	16	13.0	41 3.2
Cancer all other sites	5.7	6 1.1	9.8	11	8.6	15	24.1	32 1.3
Asbestosis	n.a.	1	n.a.	10	n.a.	22	n.a.	33
All other causes	65.1	44 .67	89.4	94	78.3	61	232.8	199 .85
Total all causes	76.4	73 .95	107.7	161	95.9	187	280.0	421 1.5
Person-years of observation	3726		4406		2898		11,030	

[a] 632 members were on the union's rolls on January 1, 1943. Nine died before reaching 20 years from first employment. All others entered these calculations upon reaching the 20-year from onset of first exposure point.

[b] Expected rates are based upon age-specific death rate data of the U.S. National Office of Vital Statistics from 1949-67. Rates were extrapolated 1943-48 from rates for 1949-55, and for 1968-71 from rates for 1961-67.

[c] U.S. death rates not available, but these are rare causes of death in the general population.

Table 5 (slide # 9)

This slide illustrates the apparent synergism between cigarette smoking and asbestos associated cancer. Tabulated are the deaths from lung cancer (expected and observed) among 17,800 U.S. and Canadian asbestos insulation workers between 1967 and 1972. The deaths are partitioned into smokers, non-smokers, and smoking habits not known. There were 5.6 times as many observed lung cancer deaths than expected among those whose smoking habits were not known; 5.7 times as many among the cigarette smokers and 0.3 times as many among the non smokers (2 observed; 7.51 expected). Note that the calculated expected death figures are based on mortality rates which disregard smoking habits. It has been calculated elsewhere that an asbestos worker who smokes has a 90 times greater risk of dying of lung cancer than a non-smoking non asbestos worker.

The lung cancers classified here were observed to occur with the same frequency for the various histologic types as observed in the general population.

It is interesting that similar studies of the smoking habits of those asbestos workers who died from mesothelioma or G.I. cancer did not show any difference in risk based on smoking habits.

It appears that asbestos enhances the carcinogenicity of cigarette smoking.

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Table 5

Expected and observed deaths of lung cancer among 17,800 U.S. and Canada asbestos insulation workers, January 1, 1967-December 31, 1972; Relation of cigarette smoking

	No. of persons	Deaths from lung cancer		
		Expected*	Observed	Ratio
Smoking habits not known	6,144	16.76	94	5.6
History of cigarette smoking	9,590	31.60	179	5.7
No history of cigarette smoking	2,066	7.51	2	0.3
Never smoked	1,457	4.40	1	0.2
History of pipe and/or cigar only	609	3.11	1	0.3

*Expected deaths based upon age-specific U.S. mortality rates for white males disregarding smoking. Lung cancer estimates based upon U.S. rates for cancer of lung, pleura, bronchus and trachea, categories 162 and 163 of the International Classification of Diseases and Causes of Deaths, 7th Revision.

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Table 4 (slide# 10)

This slide illustrates the effect of the elapsed period from time of onset of work exposure on the risk ratio of death from lung cancer in 17,800 U.S. ans Canadian asbestos insulation workers.

For the first ten years of exposure there are no observed deaths. After 10-14 years 5 are observed; 1.97 expected (a risk ratio of 2.5)
After 30-39 years from time of onset of exposure the risk ratio is highest at 7.3.

It is a sobering thought that we are now about 30 years from the mid 1940's when thousands of workers were exposed in shipyards and other war-related work at a time when this risk was not appreciated.

The cases that we are seeing now had their beginnings then. It is thought that even if a worker is subsequently removed from a dusty work environment the fibers which are already in the lung stay there and have their devastating effect 20-50 years later.

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Table 4

Deaths from lung cancer among 17,800 asbestos insulation workers in the U.S. and Canada, January 1, 1967-December 31, 1972; relation to elapsed period from onset of work exposure

Years from onset	Lung cancer		
	Expected deaths	Observed deaths	Ratio
< 10	0.56	0	--
10-14	1.97	5	2.5
15-19	5.87	23	3.9
20-24	9.55	34	3.6
25-29	10.70	56	5.2
30-34	8.20	60	7.3
35-39	4.68	29	6.2
40-44	4.84	27	5.6
45-49	4.51	19	4.2
50+	4.97	22	4.4
Total	55.87	275	4.9

Expected deaths are based upon age-specific white male death rate data of the U.S. National Office of Vital Statistics. Rates for 1972 were extrapolated from data for 1967-1971.

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Table 2

Expected and observed deaths among
17,800 asbestos insulation workers
in the United States and Canada
January 1, 1967 - December 31, 1972

	Expected*	Observed
Total deaths - all causes	960.02	1,358
Cancer all sites	175.55	575
Lung cancer	55.87	275
Pleural mesothelioma	**	29
Peritoneal mesothelioma	**	63
G.I. cancer	37.79	61
All other cancer	81.89	147
Asbestosis	**	101
All other causes	784.47	682
Number of persons	17,800	
Person-years of observation	102,864	

*Expected rates are based upon age-specific white male death rate data of the U.S. National Office of Vital Statistics. Rates for 1972 were extrapolated from rates for 1967-1971.

**U.S. rates are not available, but these are rare causes of death in the general population.

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Table 2 (slide#11)

This slide shows the breakdown of expected vs. observed deaths among the same 17,800 asbestos workers in the U.S. and Canada between 1967 and 1972.

The epidemiological studies on asbestos workers and the tables used are the work of I.J. Selifoff, E.C. Hammond, et. al.

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