No. 17-1104

IN THE

Supreme Court of the United States

AIR AND LIQUID SYSTEMS CORP., CBS CORPORATION, AND FOSTER WHEELER LLC,

Petitioners,

v.

ROBERTA G. DEVRIES, Administratrix of the Estate of John B. DeVries, Deceased, and Widow in her own right,

Respondent.

INGERSOLL RAND COMPANY,

Petitioner,

v.

SHIRLEY MCAFEE, Executrix of the Estate of Kenneth McAfee, and Widow in her own right,

Respondent.

On Writ of Certiorari to the
United States Court of Appeals for the Third Circuit

JOINT APPENDIX (VOLUME II OF II)

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PETITION FOR CERTIORARI FILED JANUARY 31, 2018
CERTIORARI GRANTED MAY 14, 2018

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JOHN B. DEVRIES

* * *

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Q. And do you recall whether or not that was insulated in any way?

A. Not to my recollection. It was powered by I guess a diesel engine and being emergency it was rarely used when I was on board ship. And it was in a space removed from the main engine rooms and boiler rooms.

Q. And would — strike that. Okay. With regard to the forced draft blowers that counsel asked you about earlier, first of all, how many forced draft blowers from Westinghouse do you recall on the TURNER?

A. I believe there were two for each boiler, four boilers, eight blowers.

Q. And what was the purpose of a forced draft blower?

A. To burn the black oil to generate heat, generate steam.

Q. And how high would temperatures get on the forced draft blower, if you know?

A. I don't recollect.

Q. What would happen if you touched it hand to bare metal?

A. I don't remember the temperatures.

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Q. Okay. Do you remember whether or not they were insulated?

A. They were insulated or parts or connections were. And I'm unclear to the details of those.

Q. Was it necessary over the three years you were on the TURNER to supervise or be involved in the maintenance or repair of any of these four Westinghouse forced draft blowers?

A. Eight blowers.

Q. Eight blowers?

A. Two to each boiler.

Q. Two to each boiler. Okay.

A. And, yes, we repaired them.

Q. And would that have exposed you to asbestos, to your knowledge?

A. The insulation portion of the removals, yes.

Q. Okay. And did that make dust?

A. Yes.

Q. Did you breathe it?

A. Yes. I —

Q. With regard to forced draft blower

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turbines, what's a forced draft blower turbine?

A. A turbine powers the blower.

Q. Okay. But would it be fair to say that the forced draft blower turbine is attached to the forced draft blower?

A. The turbine is the power source to turn the wheel, the blower wheel.

Q. Okay. And, again, is the turbine — so the turbine is part of the blower. So there were eight of them on the TURNER at that time —

A. Yes.

Q. — from Westinghouse?

MR. KATNER: Objection to form, but —

MR. REICH: Okay, I'll re-ask that.

BY MR. REICH:

Q. How many, how many forced draft blower turbines were there on the TURNER from Westinghouse?

A. Eight.

Q. Okay.

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A. Yes, eight.

Q. And would it be necessary to maintain those eight blowers and turbines?

A. Yes.

Q. And would the maintenance require handling or disturbing any of the insulation that was on it?

A. Insulation on the turbine on the steam end on the — yes, on the —

Q. And how frequently would that occur among the eight?

A. Several of the blowers were relatively trouble free and only required routine maintenance. Several blowers seemed to be very temperamental and require frequent maintenance.

Q. What's a main condenser circulating pump?

A. You mean condensate pump?

Q. I'm sorry?

A. You mean condensate pump?

Q. Condensate or condensate pump, yes, I do, either pump or turbine, pump connected with that.

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A. Yeah. This is a case where you had a turbine powering a pump moving water from the condenser, moving hot water.

Q. How many of those were on the TURNER from Westinghouse?

MR. KATTNER: Wait. Objection to form, asked and answered about motors.

MR. REICH: I'll re-ask it.

BY MR. REICH:

Q. How many of these circulating pump turbines were on the TURNER from Westinghouse?

A. That is in Exhibit 2. I need to either look at Exhibit 2 or -—

Q. You don't recall off the top of your head?

A. Right.

Q. What's the purpose of that devise?

A. The condensate pump takes water from the condenser.

Q. And what does it do with it?

A. Delivers it back into the system to make steam.

Q. Would each of the boilers require that piece of equipment?

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A. It's required to get the water that's been condensed in the condenser back into this closed loop system.

Q. And would that piece of equipment require maintenance or repair while you were on the TURNER?

MR. KATTNER: Continuing objection. I don't see anything in these records suggesting that there's any pump supplied by Westinghouse. We may have turbines. We may have helical gears. We may have motors, but I don't see anything from a pump from Westinghouse or GE. So unless you have —

MR. REICH: Nobody is saying that those documents are complete. It's what we have for now. If there are other documents that will turn up as a result of a search at the archives, then, you know, they'll be evidence or they won't be, whatever it turns out. But I can certainly ask him from his recollection to tell us —

MR. KATTNER: Well, to extent my client may not have manufactured

* * *

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about the main condenser circulating pump turbines.

MR. KATTNER: Okay. That's a different thing.

MR. REICh: Okay.

MR. KATTNER: I thought you were asking about the pumps.

MR. REICH: Okay. I'm talking about the pump turbines right now.

THE WITNESS: The turbine.

BY MR. REICH:

Q. Right. And how many of those do you recall — you don't recall how many of those there were.

A. Well, I guess there were four.

Q. Is that an estimate?

A. That is an estimate.

Q. Okay. That's fine. And was there required to be maintenance or repair work on these pump turbines or turbines connected to those pumps, to your knowledge?

MR. KATTNER: Objection to form.

WITNESS: I view the pump

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turbine combination as the piece of equipment that requires maintenance. So whether it be the pump end or the turbine end or turbine motor end, whatever, I view the unit — view this as a unit.

BY MR. REICH:

Q. Okay. And was that unit insulated?

MR. KATTNER: Object to form.

THE WITNESS: Turbines were insulated, the pump when it handling a hot media, insulated, yes.

BY MR. REICH:

Q. Okay. And was it necessary to disturb or remove any of the insulation on the Westinghouse turbines that were attached to those pumps?

A. In most cases it would have to have been.

Q. Did that make dust?

A. Any time you remove insulation, or at least in my experience on the TURNER, any time insulation was disturbed you got dust.

Q. And did you breathe that dust?

A. And if you were close to it and

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unfortunately I knew no better I was close to it all the time either instructing somebody or looking, inspecting for myself.

Q. So specifically when removing or handling the insulation on the Westinghouse turbines attached to these pumps did that give off dust that you breathed?

A. Removal of insulation on the pump turbine would give of — did give off dust and I would have breathed it.

Q. Okay. Were there any warning labels on any of the General Electric equipment as to the dangers of asbestos?

MR. KATTNER: Objection to form.

THE WITNESS: None.

BY MR. REICH:

Q. Were there any warning labels on the Westinghouse equipment on the TURNER with regards to the dangers of asbestos?

A. None.

MR. REICH: You may Redirect if you choose.

* * *

REPORT OF MATERIAL INSPECTION

OF

U.S.S. TURNER (DDR 834)

HELD

16 MAY 1957

COMMANDER DESTROYER SQUADRON FOURTEEN

MISSION BY COMMANDER DESTROYER DIVISION ONE HUNDRED FORTY TWO

AND U.S.S. KENNETH D. BAILEY (DDR 713)

AT

TARANTO, ITALY

* * *

III – GENERAL COMMENT

1. The U.S.S. TURNER (DDR 834) is a destroyer of the Gearing (692–711) class, 390 feet, 6 inches overall lengyh, 40'10" beam, 3460 ton full load displacement, twin screw, 60,000 SHP, geared turbine drive. The vessel was built by the Bath Iron Works, Bath Maine, and was first commissioned 12 June 1945. The last docking was 12 September 1955 in the Philadelphia Naval Shipyard.

2. a. Chronological summary of activities of the vessel since last overhaul:

MONTH AND YEAR	EMPLOYMENT AND AREA
APR 54 – JUN 55	Shipyard Overhaul, Philadelphia, Pa.
JUN 55 – JUL 55	ISL and Updeep, Newport, Rhode Island
JUL 55 – AUG 55	Refresher Training, Guantanamo Bay Cuba
SEP 55 – OCT 55	Type Training and Upkeep; restricted availability Boston Naval Shipyard for repair of Sonar Dome.
NOV 55 – FEB 56	Operations with U.S. SIXTH Fleet
MAR 56 – MAY 56	Type Training and Upkeep, Newport, Rhode Island
JUN 56 – JUL 56	Midshipman Cruise, Northern Europe and Carribean Area.
AUG 56 – OCT 56	Type Training and Upkeep, Newport, Rhode Island
NOV 56 – DEC 56	Carrier Operations, Atlantic
DEC 56 – JAN 57	Type Training and Upkeep, Newport, Rhode Island
JAN 57 – MAY 57	Operations with U.S. SIXTH Fleet

b. Periods of inactivation, immobility or non-naval service:

Date last tender availability: 18 – 25 April 1957

Number of days vessel underway since last overhaul: 680

Number of days vessel not underway since last overhaul: 135

Marine miles steamed since last shipyard overhaul: 87,627

c. Prospective date of next regular overhaul: 19 September 1957 at Boston Naval Shipyard.

3. a. Date of last InSurv Inspection: 22 March 1955

b. Serious damage or derangement since last Insurv Inspection:

(1) The feed water was contaminated with oil on 7 August 1956

(2) The tubes were out in number one boiler on 28 April 1956

c. Status and Fleet assignment of vessel: Active – Atlantic Fleet [illegible]

* * *

VI – MACHINERY INSTALLATION

1. GENERAL

GENERAL COMMENT

a. The machinery and boilers of the USS TURNER were, in gene [text cut off in original] in satisfactory condition. Logs and records were well maintained and up to date. However, the

Machinery Histor [text cut off in original] and CSMP were not up to date. The material condition and appearance of the engine-rooms and the firerooms was in an unsatisfactory state.

MAIN ENGINES

b. The main engines consist of two 30,000 SHP, LP and HP tur manufactured by the General Electric Co. Each HP and LP turbine is connected through a double reduction gear in a propeller shaft. In addition, there are two cruising turbines installed. These cruising turbines are forward and connected to the HP turbines through a single reduction gear. The latest DESLANT Machinery Inspection Report of December 1956 shows the turbines to be in good condition. Inspection of the latest bearing and thrust readings revealed no indication of an unsatisfactory condition of the turbines. All readings are within tolerance.

REDUCTION GEARS

c. The main reduction gears consist of two (2) sets of Delav [text cut off in original] Co. double helical, double reduction gears. The DESLANT Machinery Inspection Report of December 1956 show gear teeth of #1 main reduction gear to have slight pitting.

LUBRICATION

d. Results of the chemical analysis of the lubricating oil taken March 1957 by the USS EVERGLADES (AD 24) indicated oil to be in satisfactory condition for continued use.

SHAFTING AND PROPELLERS

e. Vessel last drydocked 9 September 1955. Results of last underwater hull inspection taken 20 March 1957; 2’ of the port bilge keel and 10’ of the starboard bilge keel were off because of being rolled back. No. 2 spring bearing, starboard shaft stuffing box leaks oil evidently from fuel oil tank B-9½-F.

MAIN CONDENSERS

f. The main condensers consist of two (2) single pass conden [text cut off in original] manufactured by the Foster-Wheeler Corp. The condensers in good condition.

CONDENSERS AUXILIARY

g. There are two (2) double pass auxiliary condensers manufa [text cut off in original] by the Worthington Corp. The auxiliary condensers are in satisfactory condition.

PUMPS

h. The various pumps were inspected and found to be in a satisfactory condition with the following exceptions:

(1) No. 1 and No. 2 Fire and Flushing pumps experiencing difficulty with bearings and wearing rings. The foun [text cut off in original] of both pumps were heavility corroded and rusted.

RECOMMEND

(a) SHIPALT DD991D – Replacement of Fire and Flushing Pump be accomplished and foundations be replaced.

(2) No. 1 Evaporator Brine Pump foundations were heavily corroded and rusted.

<u>RECOMMEND</u> (a) Replacement of pump foundation.

(a) No. 3 Main Feed Pump shaft sleeves heavily scored.

<u>RECOMMEND</u> (a) Renewal of shaft sleeves.

<u>PIPING, VALES AND FITTINGS</u> i. The piping valves and fittings are, in general, in satisfactory condition. The piping in the bilges, including the HP and LP drains and the Bilge and Ballast System are in poor condition. Pipe hangers and braces in the bilges are corroded and rusted.

<u>RECOMMEND</u> (1) Replacement of pipe hangers and braces. Replacement of HP drain system with heavier piping and replacement of sectic [text cut off in original] LP drain and Bilge and Ballast System which have not been renewed by tenders.

<u>LAGGING</u> j. Lagging in both firerooms and enginerooms is in unsatisfactory condition.

<u>RECOMMEND</u> (1) Renewal of approximately 75% of lagging by Naval Shipyard.

<u>EVAPORATORS</u> k. There are two (2) Griscom Russel Co., low pressure units; one 4000 GPD and one 12000 GPD unit. No. 1 evaporator was inspect [text cut off in original] and found to be in good condition. There was no scale present

RECOMMEND

(1) Acid bath at the next shipyard availability.

D.A. FEED TANKS

l. There are two (2) deaerating feed tanks manufactured by the Elliot Co. No. 1 D.A. tank was inspected and found to be in fa [text cut off in original] condition. Slight trace of oil with approximately ½ pound mud balls was found near the suction strainer. The oil deflectors in the main engines have been renewed since the last previous opening and cleaning of the No. 1 D.A. tank. No trace of oil found anywhere else in the feed water system, therefore, presu [text cut off in original] oil is carried over from the last time oil experienced in syst [text cut off in original]

BOILERS

m. There are four (4) Babcock and Wilcox 3 drum, express type, divided furnace, single uptake, superheat controlled boilers installed operating at a pressure of 600 psi at 850F. There a [text cut off in original] two boilers in each fireroom. The steaming hours since last cleaning as of 24 March 1957:

BOILER	FIRESIDES	WATERSIDES
1	194.5	644.9
2	120.7	120.7
3	0.0	579.5
4	209.7	736.0

Inspection of No. 4 boiler revealed the following defects:

(1) Excessive slag on deck both on saturated and superheat [text cut off in original]

(2) Plastic front cracked on both sides.

(3) Back walls and slopes spalling on both sides.

(4) Studded tubes on both sides required patching with chr [text cut off in original]

(5) Bailey feed water regulator inoperative. Does not hold water level and is not completely connected.

(6) Drain holes plugged. Leakage of fuel oil from burners into air casing occurs.

(7) Boiler requires better preservation underneath.

(8) Superheater inspection plates and exonomizer not opened [text cut off in original] inspection.

(9) All main steam hanger springs in poor state of preserve due to rusting.

<u>RECOMMEND</u>

(a) Installation boiler compound injector tank both fir [text cut off in original] Complete rebricking No. 4 boiler.

<u>UPTAKES AND SMOKEPIPES</u>

n. The uptakes and smokepipes were in unsatisfactory condition due to heavy accumulation of dirt and dust. DESLANT Class [text cut off in original] Item

DD111 – the installation of coaming around the forced draft intakes has been 50% completed.

<u>RECOMMEND</u>

(1) SHIFALT DD1098 – modify air intake louvre for forward smoke stack be accomplished.

<u>FORCED DRAFT BLOWERS</u>

c. There are eight Westinghouse electric turbine driven propel forces draft blowers. The blowers, in general, are in good condition. The counterweight on the flaps on No. 6 blower not balanced and will not close the flaps.

<u>RECOMMEND</u>

(1) SHIPALT 1047K – Modification to lube oil system be accomplished.

<u>FUEL APPARATUS</u>

p. The fuel apparatus, in general, was in satisfactory condition [text cut off in original]

<u>REFRIGERATION UNIT</u>

q. There are two Carrier Model 7H5 freon 12, 2 ton capacity ea [text cut off in original] refrigerating units. Units were found to be on a satisfact [text cut off in original] condition. However, there was a scale on the condenser whi [text cut off in original] the ship's force is unable to clean because of lack of equi [text cut off in original]

<u>RECOMMEND</u>

(1) Shipyard clean scale from the condensers.

<u>INSTRUMENTS MECHANICAL MEASURING</u>

r. The instruments were, in general, in satisfactory condition. Numerous gauges required calibration and several gauge glass [text cut off in original] were broken.

REPAIR EQUIPMENT LIFTING JACK	s.	Repair equipment and lifting jack appears to be adequate and in satisfactory condition.

* * *

NO. 90-23333

	§	IN THE DISTRICT
	§	COURT OF HARRIS
IN RE: ASBESTOS	§	COUNTY, TEXAS
CASES	§	
	§	MASTER
	§	ASBESTOS FILE

DEFENDANT WESTINGHOUSE ELECTRIC CORPORATION'S ANSWERS AND OBJECTIONS TO PLAINTIFFS' INTERROGATORIES AND REQUEST FOR PRODUCTION TO DEFENDANTS

Defendant, Westinghouse Electric Corporation ("Westinghouse") hereby responds to Plaintiffs' Interrogatories and Request for Production to Defendants as follows:

PRELIMINARY STATEMENT AND GENERAL OBJECTION

The information sought in these interrogatories and requests for production has been provided to plaintiffs many times previously. Some of these matters have been the subject of numerous depositions. Also, plaintiffs' counsel have reviewed hundreds of thousands of pages of Westinghouse documents previously produced, as evidenced by the inclusion of Westinghouse documents in plaintiffs' Master Exhibit List. Therefore, Westinghouse objects to these discovery requests as redundant, overly broad, and intended only to harass and waste the resources of Westinghouse. Westinghouse respects the fact that these discovery requests are in a form which has been used in asbestos cases against defendants whose primary business was the manufacture of asbestos thermal insulation. For the reasons set forth below, Westinghouse respectfully submits that this discovery, as applied to Westinghouse, is unduly burdensome and would require Westinghouse to invest massive financial and manpower resources which far outweigh the likelihood that this effort would lead to the discovery of admissible evidence. Westinghouse

* * *

s. identify any warning labels, inserts or other writings provided with such product and with every such printed warning; state what period of time it has or had accompanied the product, the exact wording of the warning, any amendments made to the wording, where the warning was located on each product or packaging, and on what asbestos products the warning appear(ed);

t. geographic distribution range of each such product.

RESPONSE: See Preliminary Statement and General Objection. Westinghouse objects to responding to this Interrogatory for any products not alleged to have contributed to the injuries of plaintiffs on the grounds that it is overly broad and unduly burdensome and seeks information which is irrelevant and immaterial to these proceedings and which is not reasonably calculated to lead to the discovery of relevant, material or admissible evidence. Westinghouse further objects that this Interrogatory is overly broad, burdensome and harassing. Subject to and without waiving these and the foregoing General Objection, Westinghouse responds as follows:

Because of the unlimited scope of this Interrogatory, the number of years Westinghouse has been in business, the size of its operations, and the way its divisions have customarily retained and stored records, much of the information sought by this Interrogatory cannot be provided. Historically, Westinghouse has manufactured and sold equipment and components for the generation, transmission, use and control of electricity. Since its founding in the 1800's, Westinghouse has sold many thousands of different products, with hundreds of thousands of variations of those products.

Westinghouse did not mine, manufacture or sell asbestos fiber. Where Westinghouse incorporated asbestos into a product it was used as the best commercially available material to satisfy a particular need incidental to the end product being manufactured. Consequently, it was not routinely done.

Based upon good faith information and belief, the following is a list of the types of products sold by Westinghouse which at some point in time may have contained some amount of asbestos. No attempt is made to distinguish between these products as to the type or amount of the asbestos fibers into the air. In many instances, these "products" are themselves components in other end-products. Further, only certain variations of these products contained asbestos during certain periods; many other variations contained no asbestos.

air conditioners and compressors
armatures
brakes for motors, bridge hoists, cranes and other industrial equipment and linings
bus ways
circuit breakers
condensers
control rod drive mechanisms
control items such as relays, contactors, arc chutes overhead controls, and switches
CPL arrester
CRC test press
DC contractor
electronic tubes
elevators
escalators
fans
flexible laminate
floodlights, aviation lights and light fixtures
fluorescent lights
gaskets in equipment
generators
governors
heat transfer products
heating coils
high voltage incandescent lamp, 23OV
induction heating equipment and systems
JF autostarter
lighting arrestors
liquid slip regulator
mercury lamp
mercury vapor rectifier
micarta
molded line traps

molded parts for electrical equipment, including:
- spacer barrier
- mounting or terminal blocks
- electrical insulator sleeve
- plug board
- barrier support
- coil shield

motors (split phase, traction, D.C. fractional horse, capacitors, single phase) and internal insulating materials
moveable building wall panels
network protectors
oxygen analyzer probe assembly
oxygen shield
power reclosures
pumps
range timer
reactor components
redactor gears
sleeving
SVS arrester
steam & gas turbines and ancillary insulation
switchgears
tape
thermal demand meter
toasters
transducers
transformers
valves
varnish treated paper
welding electrodes
welding machines

wire wound resistor assembly

Upon information and belief, Westinghouse distributed, through Westinghouse Electric Supply Company (WESCO), a Westinghouse division, numerous products, manufactured by Westinghouse and other companies, some of which contained asbestos at some points in time. The following is a list of asbestos-containing products of other companies that were available for sale through WESCO.

American Beauty Heater Cord
Armored Thermostat Cable
Asbestos Insulated Heat-resisting Fixture Cord, Type AF
Asbestos Insulated Wire and Cable
Asbestos Ranger and Rheostat Wire "Rockbestos"
Collyer Asbestos Heater Cord
General Cable Asbestos Insulted Fixture Wire
General Cable Asbestos Insulated Flexible Cord
Heater Cord Type HPO
Rockbestos Asbestos Varnished Cambric Wire Types ABC and AVP
Rockbestos Asbestos-covered Nickel Cord
Rockbestos AVC Boiler Room Wire and Cable
Rockbestos AVC Switchboard Wire
Rockbestos Heat Resisting Fixture Wire
Rockbestos Power Cable
Rockbestos Stove Wire
Rockbestos Table LH Hotbed or Industrial Heating Cable
Thermostat Cable

* * *

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A. That is correct.

Q. How are you presently employed?

A. I am presently employed with Westinghouse.

Q. And what is your title and your position?

A. I am Design Verification Manager.

Q. Where do you work?

A. I work in Sunnyvale, Westinghouse Electric Marine Division, Post Office Box 3499 at Sunnyvale, California, and the zip is 94088.

Q. How long have you been Design and Verification Manager in that location?

A. Seven years.

Q. And prior to that time, what did you do prior to that time?

A. You know, it is easier if I go —

Q. Forward in time?

A. Forward in time.

Q. Let's do that then.

A I know I had problems last time.

I started with Westinghouse in 1953 as a design engineer. I held that position until 1964, and I went to Sunnyvale, that's as a Senior Design Engineer. In 1967 I became a supervisor of turbines. In 1971 I was Nuclear Products Manager. In 1976 I was Supervisory Engineer on turbines. And then 1980 I became Advisory Engineer, and

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then in 1985 I became Design Verification Manager.

Q. At some point in time did you begin to become involved with marine turbines as opposed to land-base turbines?

MR. BROWN: Let me object to the form of the question. I don't think he has ever testified he has been involved with land-base turbines.

MR. WATERS: Q. Have you been involved with land-base turbines or marine turbines throughout your career?

A. I have only been involved with marine turbines.

Q. 1953 to '64, where were you working?

A. Lester, Pennsylvania.

Q. Is that a manufacturing facility?

A. Yes, it is.

Q. Did they manufacture marine turbines at that facility?

A. Yes, they did.

Q. Do you know, have they continued to manufacture marine turbines at that facility?

MR. BROWN: Let me object to the form of the question, continued since what time period?

MR. WATERS: Since he began working in 1953.

THE WITNESS: In 1964 the marine division was transferred to Sunnyvale.

* * *

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A. No.

Q. Just to clarify, is your response that you did not know, or is your response that no, Westinghouse never recommended any materials?

A. No, Westinghouse never recommended any such materials.

Q. And what is your knowledge based on in that regard?

A. The naval architect is responsible to cover the turbines and the other piping insulation in the engine room so that personnel will not be burned.

Q. And is that the case today, that responsibility of the naval architect?

A. Yes.

Q. And was that the case in 1953?

A. Yes.

Q. Do you have any knowledge as to what was the situation from 1910 to 1953?

A. No

Q. Does Westinghouse provide written materials to its customers with respect to the operation and maintenance and installation of Westinghouse marine turbines?

A. Yes.

Q. Do those written materials make any reference to

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the use of thermal insulation on the materials —

A. Yes.

Q. — turbines?

A. Yes.

Q. And do those references, or do those comments or whatever, suggest that any type of — particular type or composition of thermal insulation be used?

A. No.

Q. Is it your testimony that those written materials would merely state insulation, these parts should be insulated, or something to that effect?

A. That is correct.

Q. Have you reviewed any such written materials in order to facilitate your understanding of that?

A. No.

Q. Is that just something you know from general knowledge?

A. Yes.

Q. Are you aware that with respect to land-based turbines, Westinghouse provides specifications suggesting what particular types of insulation should be used on the turbine?

A. No.

Q. Does Westinghouse retain any instruction materials or manuals with respect to installation or

* * *

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gaskets for the moment, was there any other use of asbestos with respect to manufacturing or constructing Westinghouse marine turbines?

A. No.

Q. With respect to gaskets or asbestos containing gaskets used in the manufacture of Westinghouse marine turbines?

A. Yes.

Q. And where would the gaskets be used?

A. Mainly on steamlines.

Q. Did Westinghouse manufacture its own gaskets, asbestos-containing gaskets, or did it purchase them from someone else?

A. It purchased the gaskets.

Q. Do you know where it purchased its asbestos-containing gaskets?

A. No.

Q. Did Westinghouse instructions for the marine turbines call for asbestos-containing gaskets to be used as replacement parts?

A. Yes.

Q. And in your experience, Mr. Gate, about how frequently would it be necessary to replace gaskets that were used on steamlines?

A. Only during overhaul or inspection.

* * *

Warren Steam Pump Company, Inc. Warren, Mass.

Date	Nov. 15, 1940	74757
Bought of	Westinghouse Elec. & Mfg. Co. 150 Broadway, New York City	Purchase Order No. A-15320-1-2-3-4-5-6-7 S.O. No. F.O.B.
Ship Via	Terms	

Fed. Ship., Cont. NOd-1433, DD445-8, DD464-6

Beth. Iron Cont. NOd-1434, Destroyers DD449-51, DD467-9

Beth.Steel Cont. NOd-1435, Destroyers DD470-71

Fed. Ship. Cont. NOd-1503, Destroyers DD498-502

Beth. Iron Works Cont. NO-1506 – Destroyers DD507-517

Seattle-Tacoma Shipbldg. Co. Cont. Nod 511, DD554-68

Beth. Steel Cont. NO-1507, Destroyers DD518-525

Beth. Steel Cont. NO-1508, Destroyers DD526-543

Beth. Steel Cont. NO-1509, Destroyers DD544-549

Material on this order comes under the cognizance of the Bureau of ships. USN.

154– (2 per vessel) Westinghouse vertical geared steam turbines for driving Main Condenser Circulating pumps.
Price……………………………………$1,039,500.00

77– (1 per vessel) sets of turbine spare parts.
Price……………………………………$146,300.00

77– (1 per vessel) sets of tools, including two (2) of special wrenches.
Price……………………………….$15,400.00

1– Set type D finished plans
Price……………………………….$240.00

Additional sets of type D finished plans shall be furnished at $160.00 per set.

Such Copies of material for instruction books as required by Subsection S1-1. Price included in turbine price above.

Prices are F.O.B. South Philadelphia, Pennsylvania with transportation allowed to Warren, Mass.

Terms: Net 90 days.

Total net weight, each turbine	3000 lbs.
Total net weight of each set of spares	750″
Total net weight of each set of tools and wrenches	200″
Estimated weight of Navy boxing	250″

Schedule of shipping requirements to be given later. One shipment to start April 1, 1941.

These turbines are to be substantially duplicates of those being furnished for Cruisers CL51. 54 on our purchase order 57530. Slight modifications may be necessary in order to incorporate these units into the machinery design of the above vessels.

Fifteen (15) copies of type B detail drawings to be submitted prior to December 1st, 1940.

These turbines are to be designed to operate with steam pressure at turbine throttle 575 lbs./sq.in, gage saturated and 15 lbs./sq.in., gage back pressure. When operating with the above designed conditions, turbines are to develop 305 BHP at 865 RPM of the gear shaft, with a guaranteed steam consumption of 33.1 lbs./BHP/Hr. and to develop 138 BHP at 580 RPM with a steam consumption of 49.5 lbs./BHP/Hr.

NOTE: Turbines to be suitable for a steam drum pressure of 665 lbs./sq.in. gage saturated. Working steam drum pressure shall not exceed 600 lbs./sq.in. gage. Turbines glands shall be designed for a 35 lb. sq.in. gage back pressure notwithstanding the fact that the working back pressure will be 15 lbs./sq.in gage. Turbines shall also be capable under emergency conditions of carrying the normal rated load when exhausting against a back pressure of 20 lbs./sq.in. gage, other conditions being normal. Relief valves shall be set at 25 lbs./sq.in. gage.

These turbines will all be of the same rotation but steam and exhaust connections are to be located so as to suit the requirements of installation on these vessels.

In general, these turbo gear sets are to be designed for variable speed operation and equipped with speed limiting governors (without overspeed trip).

The turbines will be of the impulse, re-entry type. A single disc rotor having one row of blades will be overhung from a pinion shaft. The turbine rotor will be a steel forging mounted on the end of a steel shaft which also forms the pinion. The blades will be of corrosion resisting steel set in a groove in the rotor and fastened by pins. The gear will be double helical spur type hobbed on a forge steel rim. The gear case will be of steel construction and will contain the oil reservoir in the base. The gear shaft will extend vertically down to connect to the pump shaft by means of a rigid coupling. These units shall be arranged with suitable spigot for mounting with the pump and the gear shaft will be required to carry a pump thrust in a downward direction of 5500 lbs. including the weight of the pump rotor. Lubricating oil will be supplied by an impeller on the bottom of the pinion shaft taking suction direct from the oil reservoir in the base of the gear cusp. The lubricating oil system to be complete with cooler, filter, pressure gauge, oil level gauge, thermometer, and necessary piping. In order for the unit to line up properly, it will be necessary for the center of the shaft to be in the center of the counterbore circle with a tolerance of .004″ and the finished face of the gear case shall be at exact right angles to the turbine gear shaft with a tolerance of .002″.

The following fittings are to be furnished with each turbine:

1 speed limiting governor (mechanical type)

1 turbine exhaust relief valve, nominal size. equal to nominal size of steam inlet

1 steam strainer

1 lubricating oil pressure gage

1 lubricating oil thermometer

1 lubricating oil cooler

1 lubricating oil strainer

1 lubricating oil level gage.
Necessary drain connections and drain valves

Insulation shall be furnished and installed by the shipbuilder after installation of the units in the vessel. Insulation and lagging shall be shown on the type B drawings in accordance in Subsection 539-1 of the General Specifications of Machinery.

All connections shall be extended a sufficient distance beyond the lagging to allow for the completion of the connection aboard the ship without disturbing the insulation or the lagging.

Each set of spares to consist of the following items and shall be in accordance with the General Specifications for Machinery, Section [illegible]

2 sets of ball bearings

1 set of sleeve bearings

1 set of nozzle blocks

1 set of reversing chambers

1 set of governor wearing parts

2 oil cooler cores

2 oil strainer baskets

* * *

For shipyard use	BATH IRON WORKS CORPORATION BY GIBBS AND COX, INC. 21 WEST STREET, NEW YORK, N.Y.	DATE August 15, 1938
PURCHASE ORDER NO.		NO. DD423 & 424 43034
DATE		Page 1 of 6

material requisition

1. PROPOSED TO BE PURCHASED FROM
Westington Electric & Mfg. Co.

Date of Quotation 7/14/38; 7/11/38; 6/27/38

Delivery Spec. in Quo. 31 wk

2. Material for Destroyers DD423 & 424 Bath Iron Works Corporation

3. Material under Cognizance of Bureau of Engineering

....

4.

Job No.	**Item No.**	**Quantity**	**Description**	**Approx. Shipping Weight**	**Guaranteed Finished Weight**
		for two vessels	MAIN FORCED DRAFT BLOWERS		
			Note: Quantities Listed are for two vessels		
	1	16	Main Forced Draft Blowers, horizontal propeller		2587 lbs each.

		type, direct connected steam turbine driven, each complete with attachments and fittings as listed in Appendix B	
2	8	Sets blower controls, each set to control speed of one pair of blowers by single handwheel.	122 lbs per set
3	2	Sets of spare parts for the above units	740 lbs per set
4	4	Sets of tools and special wrenches for the above units	234 lbs per set
5	2	Navy Boxing for Item 3	325 lbs per ship approx.

5. Remarks:

MANUFACTURE: Westinghouse Electric & Mfg. Co., Essington, PA

DD 423 and 424
Approved as
Requisition Only By
Inspector of Machinery
AUGUST 30, 1938

BATH IRON WORKS
CORPORATION
BY GIBBS AND COX, INC.

H. L. Culpepper

IMPORTANT: READ APPENDIX "A"

* * *

APPENDIX B

SPECIFICATION FOR MAIN FORCED DRAFT BLOWERS

(a) GENERAL SPECIFICATIONS: Main forced draft blowers are to be in accordance with Bureau of Engineering General Specifications for Machinery, as listed in Item 8, page 2, and as approved.

(b) SPECIAL SPECIFICATIONS: Main forced draft blowers are to be in accordance with the requirements of Special Specifications for Propelling Machinery for U.S. Destroyers DD423&424 and DD429to436, inclusive, as follows:

"S53-1. FORCED DRAFT FLOWERS (Dated May 1, 1934)"

"There shall be eight identical main turbine-driven Class C forced-draft blowers, two installed for each boiler. Each blower shall be supplied with outside air through a suction truck from the deck. The blowers shall be connected to and shall discharge through automatic balanced shutters or dampers and suitable ducts, to the pressure space between the inner and outer boiler casing. Positive air closure will be required so that each blower of a pair operating on the same boiler can be used independently of the other. Provision shall be made for drawing air into the main blower intakes from the upper part of the firerooms.

The sound characteristics, volume and pitch, of the blower units shall be a minimum consistent with capacity, pressure, and space factors. Sound-insulated inlet ducts shall be furnished as specified in the detail hull specifications. The arrangement and insulation shall be satisfactory to the Bureau of Engineering.

The Bureau will give consideration to the substitution of Class A (propeller type) blowers for Class C blowers during the development of the contract providing satisfactory sound insulation shall have been developed for this type of blower."

"S50. AUXILIARY TURBINES – All auxiliary turbines, except those driving the turbo-generators, shall be designed to give normal rated capacity at 590 pounds per sq. in. gage saturated-steam pressure at the throttle when exhausting against a back pressure of 15 pounds."

"S50-1. HORIZONTAL TURBINES, GENERAL AUXILIARY (Dated 1 Feb. 1934)." "Sizes of steam and exhaust connections shall be as approved when the final design is submitted of the system in which the turbines are to be installed."

(c) TYPE: Class A, Horizontal Propeller, direct connected steam turbine driven.

(d) CHANGEABILITY: All similar parts of blower units and spare parts must be absolutely interchangeable, so that any part may be interchanged with a similar part without any machining or fitting.

(e) COMPARTMENTS: Main forced draft blowers to be installed in two main compartments per ship.

* * *

SPECIFICATIONS FOR

APPENDIX B

MAIN FORCED DRAFT BLOWERS (Continued)

Note: In the event that the total steam consumption at anyone or more of the nine capacities listed in the vendors guarantee exceeds the total steam consumption listed above for that particular capacity, the vendor will pay the purchaser or allow a deduction to be made from the purchase price, not as a penalty but as liquidated damages at rates in accordance with the following schedule:

Condition A, \$14.30; Condition B, \$7.75; Condition C, \$3.00; Condition D, \$1.25; Condition E, \$1.05; Condition F, \$0.40; Condition G, \$0.30; Condition H and I, none; per pound of excess steam consumption for such excess team consumption or the vendor will be required to make replacements to effect the steam consumption specified at the purchaser's option.

(k) FITTINGS: Main forced draft blowers to be furnished complete and including with each unit:

One (1) master nozzle control valve

One (1) steam strainer

One (1) set drain valves as required

One (1) speed limiting governor

One (1) oil pressure or tachometer gage.

One (1) thermometer for lub. oil reservoir temperature

One (1) oil level gauge for lub. oil reservoir

One (1) revolution indicator

One (1) lubricating oil strainer

One (1) turbine casing relief valve, nominal size equal to nominal size of turbines steam inlet.

One (1) set lifting eyes, on all parts as required.

One (1) oil cooler.

One (1) vibrating reed hand tachometer

Control Gear: There shall be furnished with each pair of blowers –

Five (5) Single mitre gears complete including stub shaft, pins and collars.

One (1) Triple mitre gear complete including stub shaft, pins and collars.

One (1) Indicator, bracket and handwheel complete.

Two (2) Stuffing boxes complete.

All other required fittings and attachments will be furnished by the purchaser, including turbine heat insulation and layering.

(l) SPARE PARTS: Spare parts are to be furnished for each ship in accordance with requirements of Bureau of Engineering General Specifications for Machinery, Subsections S53-1, S50-11 and S31-1 and as approved. The spare part are to be listed on these plans. After approval of Type B plans, the approved list of spare parts will be incorporated as a supplement to this requisition. Size, number and content of the spare part boxes shall be identical for the two vessels.

1. <u>DECLARATION OF BARRY L. CASTLEMAN</u>

I, Barry L. Castleman, declare the following under penalty of perjury:

1. I live at 4406 Oxford Rd., Garrett Park, Maryland, 20896. My education consists of a Bachelor's Degree in Chemical Engineering from Johns Hopkins University 1968. I have a Master's Degree in Environmental Engineering, which was mainly in areas related to air pollution control from Johns Hopkins University, 1972. I have a Doctor of Science Degree in Health Policy from Johns Hopkins School of Hygiene and Public Health, 1985.

2. My professional experience goes back over 30 years in the area of asbestos and other occupational and environmental health problems. My field is occupational and environmental health policy, which is a branch of Public Health, mainly oriented towards the recognition of risk factors and the prevention of disease from industrial activities.

3. The Doctoral degree was awarded for two years of course work, various examinations, and the writing of a doctoral dissertation. The course work was mainly in the areas of toxicology, epidemiology, biostatistics, physiology, and public health policy. These are the tools that are used to understand how the body works and can be damaged by toxic substances, how these effects can be identified by means of various studies of people, studies of animals experimentally exposed and so on.

4. My Doctoral thesis was, Asbestos: An Historical Case Study of Corporate Response to an Industrial Health Hazard, and is largely identical to a book published in 1984 by Prentice Hall. Law and Business

call *Asbestos: Medical and Legal Aspects* (now in its 5th Edition, 2005). The doctoral thesis is an historical review of the asbestos problem as a public health problem in society worldwide, but mainly in the United States. It encompasses a comprehensive review of medical literature of all kinds, as well as other literature available in libraries and published sources such as government publications, safety magazines, engineering journals, trade magazines, insurance publications, encyclopedias, popular magazines, and newspapers. The doctoral thesis also involved research based on unpublished government records. The government records included workers' compensation claims files where claims had been made by individuals alleging that they had asbestos-related diseases of the lungs, claims against various companies that were their employers, some of which companies were also manufacturers of asbestos insulation products these individuals has used in the course of their work.

5. In addition to published information of all kinds, I examined files, unpublished information available from the U.S. government archives, the archives of scientists and the archives of institutions that had worked for and with asbestos companies. I also looked at unpublished information which was obtained in legal discovery. This included trade association minutes, corporate documents, and testimony of corporate officials who were associated with asbestos hazards over the years – doctors, plant managers, executives, and other people who were aware of events that transpired.

6. In addition to published information and corporate knowledge that came out of mainly legal

discovery, I have also interviewed many elder statesmen in the field of industrial medicine and hygiene. They included physicians who were active in the field of occupational medicine, such as Harold Stewart, who first published on asbestosis in 1931, and Alfred Angrist, who first published on asbestos and lung cancer in 1942. They are both pathologists. Another, Dr. Wilhelm Hueper, was a leading United States authority in the field of occupational cancer and first director of the environmental cancer section of the National Cancer Institute. Dr. Irving J. Selikoff was the leading epidemiologist and asbestos authority in the US. Dr. Hueper, Dr. Harriet Hardy, Dr. Thomas Mancuso, Dr. Gerrit Schepera, Dr. Richard Doll, Dr. Morris Greenberg, and others I have interviewed were involved in the area of asbestos and health over the past decades.

7. My textbook *Asbestos: Medical and Legal Aspects* (5th ed.) contains a section on 38 companies and/or industry groups that were involved with the manufacture, sale or use of asbestos-containing materials. I have reviewed industry documents and testimony regarding all of these entities as well as may additional companies involved in the asbestos industry. I have never seen any document that discusses or suggests that the United States military prohibited any manufacturer or Seller from warning about asbestos or that the United States military interfered, in any way, with a company's decision regarding whether to issue such warnings.

8. I have also studied and written about the historical uses of asbestos warnings on products and in product manuals. Once companies began to issue asbestos warnings to product users, there is no

evidence that the United States military required the removal or alteration of such warnings for products sold to the military. In 1964, Johns-Manville ("J-M") was among the first companies to provide warnings with its asbestos-containing products, namely its asbestos insulation. During and after this time frame, J-M sold asbestos insulation to the United States military. In any extensive review of J-M documents, which have included visits to the J-M archives in Denver, Colorado, I have never seen any evidence that J-M removed or altered the warning labels that appeared on its asbestos insulation for sales to the United States military. Nor have I seen any evidence that the United States military ever requested that J-M or any other company do so.

I declare under penalty of perjury that the foregoing is true and correct.

July 18, 2008.

s/ Barry L. Castleman
Barry L. Castleman

HENRY HARTZ

* * *

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A. I finished high school in Trenton, New Jersey. I went on to college at Lehigh University in Bethlehem, Pennsylvania. I left with my graduating class. I did not graduate in 1959. I was employed at that time by DeLaval, as I stated earlier, and I left there for military service in February of 1960. I was discharged in 1964 and went back to work for DeLaval. So I retained my employment rights there.

Q. Okay.

A. And I worked for them since, 44 years.

Q. When you started at Lehigh, what was your major or —

A. Mechanical engineering.

Q And for the benefit of the ladies and gentlemen of the jury, can you tell us what a mechanical engineer, what sort of things do y'all study in college?

A. Interesting question. All engineering-related courses relative to products mechanical engineers would study. It could be automotive, could be structural, which is usually civil, but things of that nature.

Q. Did you have at that time a direction that you wanted to — how you wanted to use your ME degree?

A. At that time, no. My intent was basically to finish. And actually what I ended up doing is I finalized my education while I was working for DeLaval.

* * *

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was not something we provided with the pump at that time. You don't want the emergency packing in the pump if the seal is functioning properly.

Q. Can you tell us what packing is, what we're talking about?

A. Packing — the packing that I'm familiar with was generally a stack of what are called rings, packing rings that were alternate hard and soft rings. So you had five rings of packing that made up a set. The outer ring on both ends was a hard ring, which is like a wire mesh or some sort of a mesh type thing, and the inner the center ring was also this hard thing, and it was the soft rings that were in the middle that probably: that contained some of the asbestos fibers in the structure of the packing.

Q. Okay. And up until what year was the packing used routinely in the pumps?

A. Like I said, when I started in 1964, my recollection was mechanical seals, so I don't know when we stopped prior to that.

Q. Okay. And at that time in '64, were there some types of pumps or uses for pumps where packing was still preferred over mechanical seals?

A. Yes, there were some.

Q. Okay. And what were those?

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A. Those were in applications where you had heavy fuel or Bunker C oil, Number 6 oil. You were pumping a heavy viscose fluid. Mechanical seals were not good that type of application.

Q. Okay. Have mechanical seals in the design and engineering of those caught up now where mechanical seals can be used for all applications?

A. To my knowledge, they have been, yes.

MR. RUNYAN: Okay. The videographer needs to change the tape, so why don't we — I guess we can break for lunch now, if y'all want to, to get a jump on the crowd. We can go off the record.

VIDEOGRAPHER: We're off the record at 11:35 a.m.

(Recess from 11:35 a.m. to 12:43 p.m.)

VIDEOGRAPHER: We're on the record at 12:43 p.m.

Q. Sir, are you ready to continue?

A. Yes, I am.

Q. Great. And again, any time you need to take a break, just let us know and we will be happy to do so.

We had left off talking a little bit, gotten into the asbestos products or component parts that DeLaval may have used in their pumps. And we had talked about packing a little bit, and then I think where we just

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left off, we were talking about mechanical seals having replaced packing.

A. Right.

Q. With respect to the packing, you had said, I believe, that there are some uses even after you were there where there were — packing was still better than mechanical seals, and then now the engineering has caught up where mechanical seals can be used in almost all applications?

A. That's correct.

Q. With respect to the packing that was used, do you know when the last time was that any asbestos would have been contained in the packing with respect to the DeLaval pumps?

A. I believe that occurred in early '70s.

Q. And what do you base that belief upon?

A. When the notice became pretty widespread throughout the country, I guess, asbestos was definitely a potential problem.

Q. So you believe the early '70s was the last time any packing that contained asbestos would have been used?

A. That's my understanding.

Q. I think you have touched on it, but in case you haven't, can you tell me in the best laymen's terms that

* * *

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as part of their maintenance schedule is to go in and replace the packing in the pumps, or how would they — when would they come in?

A. Seals or packing?

Q. I'm sorry, packing.

A. Packing. They may set up a procedure where they had fixed maintenance schedules, but I think over the course of time, the Navy has learned that if it's still working, don't mess with it, in laymen terms.

Q. Okay.

A. In other words, if it's — you know, if you're not having a problem with it, even though it's a fixed maintenance time for other equipment or you have access·to it and if you're not having trouble with that, leave it alone, as long as it's functioning properly and the system works properly.

Q. Did DeLaval ever give recommendations with respect to the maintenance schedule or replacement schedule that should be used for the packing?

A. Not to my knowledge .

Q. Where would we find that if they did?

A. If it's in some of the old tech manuals, that might be available.

Q. And were tech manuals — was that — I'm assuming that's an abbreviation for technical manuals?

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A. That's correct. Sorry.

Q. Were they being supplied as what the ladies and gentlemen of the jury might refer to as a users manual type?

A. Yes.

Q. Okay. And that would be supplied with every pump?

A. In general on commercial, yes, you would get a technical manual, standard technical manual with every pump, that's correct.

Q. Let's discuss a little bit now the gaskets that may have been used with respect to the DeLaval pumps. How were gaskets utilized in their pumps?

A. Their face seals where end covers comes together with a pump case where you're going to seal so that the product stays within the pump itself. In general, depending on the application, you will use plant fiber.

Q. And for the benefit of the ladies and gentlemen of the jury, can you describe what a gasket is and why it is used in your best laymen's terms, please?

A. If you don't use a gasket, if you have two metal surfaces that come up face to face, typically it's uncommon to have them perfectly flat. If you had them perfectly flat, you could probably eliminate the gasket. But because of operating temperatures, changes in

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temperature when you go from an ambient condition to a normal operating condition, which is typically elevated temperatures above ambient, it causes for expansion of components and parts. So you can have separation at the faces. The gaskets allow you to get past that point as a link path. They prevent the leakage from occurring.

When you install the units, you bolt them up with a predetermined torque so that during operation conditions they won't leak during normal operating conditions.

Q. How did DeLaval determine what the gasket material should have been made out of?

A. It's generally dictated by the application and basically the least expensive component to buy that would be available and still serve the job.

Q. And why would they have used one material over another? Is there any particular reason?

A. Temperature — a high temperature application could cause you to get into asbestos, which is better resistant against heat.

Q. And would any part of your job duties have concerned the use of one gasket over another?

A. As far as my job duties are concerned, no. That was predetermined by engineering.

Q. Okay. Who would know more about those actual

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Q I'm going to ask you to turn to page 33 of that deposition.

A I thought you would.

Q Yes. And I'm going to have you read line 7 through line 14 .

A Okay.

> "Q What did Mr. Bouchard tell you about his experiences?
>
> "A I don't have an answer for that. I just don't remember that he had any specific comments relative to that. He just — he just said that there was an ongoing study or an ongoing evaluation or seeking of information to determine how asbestos may have been used in our products.

Q And you can stop there.

A All right.

Q So — strike that.

And you've never looked at specific documents regarding DeLaval's use of asbestos; you just have a general knowledge regarding Delaval's use of asbestos in their products, correct?

A That's correct.

Q Other than the asbestos gaskets and asbestos packing used on some of the equipment, isn't it also true

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that some of the customers at DeLaval would apply asbestos to the DeLaval equipment after they received it?

A Are you talking about pumps?

Q I'm talking about any DeLaval equipment?

A It's my understanding that turbine division made provisions for asbestos blankets, that's my understanding, which was applied by the shipyard.

Q And DeLaval knew that that was going to occur. In other words, that the shipyard would apply that asbestos insulation on the outside of their DeLaval equipment?

A Yes, sir.

Q Do you have an idea of organizations or the technical societies in which DeLaval has been a member?

A Specifically, no. I'm sure there's a lot of them, though, because they've been around for a long time and they've been associated with the Navy for a long time when they were in business.

Q Is it your opinion that DeLaval is involved in most of the major technical societies?

A I would hazard a guess to that, yes.

Q Is it your opinion that they've been member of the American Petroleum Institute for a long time?

A I suspect that they have been.

Q Do you know if DeLaval was a member of the American Petroleum Institute when you began with the

* * *

JOHN B. DeVRIES

* * *

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MR. REICH: Objection. You can answer.

THE WITNESS: Yes.

BY MR. STOKES:

Q. Is it your understanding that any material or product that went aboard the USS TURNER was determined by the U.S. Navy?

MR. REICH: Object. Go ahead. You can answer

THE WITNESS: Yes.

BY MR. STOKES:

Q. And that the U.S. Navy specified the use of any materials used aboard that ship; is that right?

A. Specified and procured.

Q. And nothing could go aboard that ship without the allowance of the U.S. Navy; is that right?

A. Yes.

Q. Were you ever present aboard the ship when it underwent any overhauls?

A. Yes.

Q. And it's my understanding when a ship undergoes overhauls it goes into a shipyard;

* * *

Kraft - Bullock – 3/15/06

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would be helpful if we go over them now then later when your attorney might ask about it.

So with that in mind, was there a particular type of motor that you all used generally unless spec'd out differently or did you all use whatever the customer spec'd out?

A. The answer is, in essence, all of the above. It could be what the customer required. It could be just a particular motor manufacturer that we were using at the time that could have easily switched to somebody else. There is no one good reason. I mean the customer might have had a specific requirement on the motor that only this certain manufacturer could comply with, so we had to go that way, so it's no one particular reason.

Q. Would your answer be the same as regards closed coupled pumps?

A. Yes.

Q. Okay. So, I guess sort of just in summary to sort of help me understand better, if I understand your testimony correctly, what motor was used could depend on a number of factors, including what the customer requested, what the customer

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needed, what the customer had and what you all may have been using at the time depending on other factors?

A. Well —

MR. SHAFFER: Object. Let me object as to form. With respect to any particular order or as the types of orders they fill?

MR. BULLOCK: Just generally. Yeah. Just generally.

MR. SHAFFER: Okay. Subject to that clarification, you can answer.

THE WITNESS: The only thing I would add to that, or what the manufacturers could actually supply to us.

BY MR. BULLOCK:

Q. Gotcha.

Now, as I understand it, centrifugal pumps or let me — let me keep them broken down so that we're being — being specific. On a closed coupled system, when a pump is completed by Buffalo Pumps and is prepared to be shipped to the end user, to the customer who's purchasing it, is the pump always shipped assembled, completely assembled?

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A. Yes, it is.

Q. Okay. At the time that it is shipped in a closed coupled system, how many different gaskets would have been installed on that particular pump?

A. It depended if it was a packed pump or – or you're talking gaskets?

Q. Gaskets only.

A. Well, it still depended if it was a packed pump or a mechanical sealed pump.

Q. Okay. In a — in a packed pump, how many would it have?

A. One.

Q. Now, that's true for all closed coupled packed pumps, centrifugal pumps, between 1950 and 1992, to best of your knowledge?

A. To the best of my knowledge, yes.

Q. Okay. If it was a mechanical seal, closed coupled pump, how many gaskets would it have on it?

A. Two.

Q. Now, as to a closed coupled packing pump that has one gasket, where would that gasket

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be?

A. It would be between the casing cover and casing joint.

Q. Okay. As to mechanical seal pump that had two gaskets, where would gasketing be?

A. Well, the first one again would be between the casing cover and casing joint. The second one would be at the mechanical seal gland and the casing.

Q. Now, other than a specific request or – or let me preface it this way: Between 1950 and 1992, other than a specific request from a customer to use a gasket that did not contain asbestos — let me back that up.

Was there a period of time between 1950 and 1992 that other than a request from a customer not to use asbestos-containing material that asbestos-containing gaskets were used in the manufacture of closed coupled pumps?

MR. SHAFFER: I'll object to the form of that question.

BY MR. BULLOCK:

Q. Do you understand the question?

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A. No, I do not.

Q. Okay. During the period 1950 to 1992, was asbestos gasketing used in closed coupled pumps that were manufactured by Buffalo Pumps?

A. Yes, they were, pursuant to specifications and other information that was supplied to us by customers.

Q. Is your testimony that it was only placed there as a requirement of specifications of customers?

A. No, it is not.

Q. Okay. If a customer did not specify – let me – let me try to keep this as clean as possible.

I understand at some point Buffalo Pumps stopped putting asbestos gasketing in their pumps unless specifically requested by a customer, is that correct?

A. There was one instance of that.

Q. Okay. But there was a point at which Buffalo Pumps on their own stopped using asbestos gasketing subject to a request from a customer?

MR. SHAFFER: Objection to the form.

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Misstates – assumes facts not in evidence, misstates the testimony. You can answer.

THE WITNESS: No. Buffalo Pumps – and this is from what all these documents show you here – began the change-out of asbestos gaskets and packing in the early 1980s.

BY MR. BULLOCK:

Q. Okay.

A. It was not a specific customer request or anything like that.

Q. Yeah. Okay. I'm not — that's not what I was trying to get at. What I'm trying to say is there was a point at which asbestos gasketing was being used and then there was a point at which it was not being used, correct?

A. That is correct.

Q. Okay. Do you recall the year or the year range in which asbestos gasketing was phased out by Buffalo Pumps on closed coupled pumps?

A. Well, this would, also, hold true to double suction, so I don't –

Q. Okay. Good. All right.

A. But it began – in the early '80s is

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when we began to phase – or the change-out.

Q. Do you recall when at what point the change-out would have been completed?

A. It was around 1985. And that reason it took to that time was because of the United States Navy.

They wouldn't allow us to replace some of the asbestos gaskets and packing that we wanted to use.

Q. Was the decision to stop using asbestos gasketing made at the same time as the decision to stop using asbestos packing?

A. The decision to start the change-out was in that same time period, yes.

Q. Okay. Now, other than product for the U.S. Navy, was there a period of time earlier than 1985 at which you had competed for non-Naval requests of pumps?

A. It was during that same time period. I don't remember the specific date.

Q. Other than Naval specifications that required asbestos gasketing and/or asbestos-packing, were there any other considerations that caused the period of time to be so long?

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MR. SHAFFER: Objection to the form.

MR. BULLOCK: If you understand the question, please answer it.

MR. SHAFFER: Object to the characterization.

THE WITNESS: Yes. There were not direct replacements for the gasket. The industry – the packing and the gasketing manufactures had not given us suitable replacements for that. And then it took a few years for them to come up with those replacements.

BY MR. BULLOCK:

Q. So the persons providing – the companies providing the gasketing material for you were responding to a request from Buffalo Pumps to change the material?

A. That was part of it. It was becoming, less available, and they were in the process of changing –

Q. Excuse me.

A. – of coming up with those replacements.

Q. Do you know whether Buffalo Pumps

* * *

AFFIDAVIT

Arthur Faherty being duly sworn upon his oath deposes and says:

1. I have been employed for many years in the fields of U.S. Navy equipment, and in the applications of U.S. Navy requirements under .military specifications, usually referred to as mil specs and issuances of the Secretary of the Navy and his designees and assignees and subordinates.

2. A copy of my CV is attached hereto and incorporated herein by reference as Exhibit A.

3. I am acquainted with the records and documents and deposition testimony concerning Plaintiff's exposure to asbestos in the Navy as well as the affidavits and/or reports of Dr. Betts and Admirals Lehman and Sargent and Captains .Lowell and Moore and David Hobson and. the letter of Drinker on which removal was based.

4. I have considerable experience in the interpretation of military and Navy documents.

5. I am aware of the Navy specification for the equipment for World War II era ships and later, known as general specification for Machinery Sub S 1-1 page 2.

6. These specifications required warnings and safety precautions.

7. I am aware of the Specifications for Shipyard Contracts.

8. The 1936 specifications required taking of precautions and warnings.

9. I am familiar with MIL-M-15071D which was the military specification and its predecessors including 15071A-C and the specifications referenced in paragraph 5 of that document, MIL-M-15071A-D

are roughly the same and involve similar requirements.

10. 15071 states that the intent of the Navy was to accept the usual commercial manual when roughly equivalent to the overall requirements of the Navy.

11. Mil Spec 15071-D was later succeeded by MIL-15071E.

12. 15071D requires submission of the manual to the Bureau of Ships which would then adopt the manual as a Navy document.

13. 15071D requires manuals to contain safety precautions (section 3.1.9.).

14. 15071D requires that all manuals must contain notes, cautions and warnings to emphasize critical instructions. (Section 3.3.6)

15. included was the definition of the term "warning" which is defined by the Navy as operating procedures and practices which will result in personal injury or loss of life if not correctly followed. (Section 3.3.6 (c))

16. 15071D section 3.1.7 requires instructions to include precautions.

17. I am also familiar with Department of Navy Sec Nav 62603.5 later Sec. NAV 5700.5 dates 1956.

18. This document is also known as Uniform. Labeling Program for Hazardous Industrial Chemicals and Materials, hereafter Uniform Labeling Program and was in place when the Plaintiff entered the Navy.

19. The Uniform Labeling Program was designed to standardize labeling requirements for hazardous products and provide labels to contain pertinent information to warn users of potential dangers.

20. The Uniform Labeling Program applied to Labeling of all hazardous materials throughout the Navy.

21. The Uniform Labeling Program was not designed to govern the type of warning labels.

22. The Navy stated that the type of labels were to be governed by state and federal laws and regulations.

23. The Uniform Labeling Program noted that development of new products makes it mandatory that precautions should be taken including warning labels. (Section 3).

24. For poisons, a skull and cross bones was to be affixed.

25. Poison is defined as a substance with an inherent property that tends to destroy life or impair health. Asbestos is essentially a poison.

26. Paragraph LC of enclosure (3) defines a Class III toxic hazard as any industrial or military material which may be give off a. harmful, vapor, dust, fume or mist during handling or operation. The injuries effect may arise front one exposure (acute) or repeated exposures over a prolonged period (chronic). The mode of entry into the body maybe by ingestion, inhalation or absorption through the skins.

27. Paragraph 2.a of the Uniform Labeling Program. refers to the Warning Labeling Guide published by the Manufacturing Chemists Association.

28. This Guide, first published in 1946, requires precautionary labels for harmful dust. The reference to the guide shows the Navy's constant concern for warnings of hazards like asbestos.

29. The only conclusion that can be drawn is that espoused by Captains Lowell and Moore whose

affidavits and essential conclusions I agree with based on my many years of experience with the Navy and ships. These are attached as Exhibit D and E.

30. This conclusion is that by the time Plaintiff began his Navy service on the Chilton the Navy required warnings of the hazards of asbestos in equipment for ships and that all claims that the Navy would have barred or prevented warning labels are untrue.

31. It is clear from these documents that the Navy wanted the warnings to reach Navy personal such as Plaintiff.

32. The Navy required manufacturers not only to warn on the products but to supply manuals containing warnings to each ship and precautions for use of the product

33. Thus, when defendants sold products for use on ships that lacked warnings that met state and federal standards and/or the standards of the Manufacturing Chemists or the American Conference of Government and Industrial Hygienists this was in violation of specific Navy directions and requirements.

34. Rather than barring warnings, the Navy encouraged warnings, and the failure to warn of the hazards of asbestos violates Navy requirements.

35. The failure to include warnings and safety precautions in their manuals of their equipment violates specific Navy requirements,

36. The claim that the Navy would have barred warnings is thus false and without basis.

37. Some of the defense experts suggest that because the Navy manuals contain no warnings the Navy believed asbestos to be safe.

38. The fact that there is no discussion of asbestos hazards in Navy documents suggest the Navy did not know of asbestos hazards.

39. Asbestos was generally required on all high heat applications.

40. In many cases the suppliers of such equipment usually supplied asbestos product with/on/in their equipment.

41. Suppliers of equipment to the Navy were engaged by the Navy to participate in renovation and overhaul of their own equipment, or that of others, including asbestos containing parts in shipyard repairs.

42. Suppliers of equipment frequently supplied replacement asbestos or disturbed previously supplied asbestos as part of their activities on ships.

43. I expect to testify, at trial, on what the Navy archive records show about equipment supplied to the vessel, or vessels at issue and what the records show as individual defendants supplying original or replacement asbestos containing equipment or disturbing asbestos.

44. Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendants was entirely removed.

45. The removal of the entire initial asbestos never occurred.

46. I cannot comment, in this affidavit, as to defendants whose material I have not yet examined, but will supplement my testimony at trial by reliance on the documents from the archives.

47. I am also prepared to discuss the use of asbestos on Navy ships.

/s/ Arthur Faherty
Arthur Faherty

Sworn to and subscribed
Before me this 14th day of
June, 2013

/s/ N.S. BAE
NOTARY PUBLIC
N.S. BAE

IN THE COURT OF COMMON PLEASPHILADELPHIA COUNTY, PENNSYLVANIA

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KENNETH E. McAFEE and SHIRLEY McAFEE, h/w	:	OCTOBER TERM, 2013
vs.	:	
20th CENTURY GLOVE CORPORATION OF TEXAS a/k/a Guard Line, Inc., et al.	:	NO. 205

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THURSDAY, OCTOBER 24, 2013

VOLUME I

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Oral deposition of KENNETH E. McAFEE, was held at Courtyard Glassboro-Rowan University, 325 Rowan Boulevard, Glassboro, New Jersey, commencing at 10:30 a.m., on the above date, before Deborah A. Brazukas, a Registered Professional Reporter, Certified Shorthand Reporter of New Jersey, License No. XI 01938, and Notary Public.

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* * *

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from — where did you graduate from high school?

A. Fort Worth, Texas.

Q. And what years?

A. 1967.

Q. Okay. Did you go to college right after that?

A. Yes.

Q. Okay. And what — what college did you attend?

A. Tarrant County Community College.

Q. And did you complete any degree?

A. No.

Q. Okay. What was your course work? What were you focusing on?

A. General studies.

Q. General studies, okay. Were you full-time?

A. Yes.

Q. And at some point you entered the U.S. Navy?

A. Yes.

Q. Okay. What year did you enter the U.S. Navy?

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A. 1969.

Q. So from — from high school, you went to college for a couple years, and then you entered the Navy after that?

A. Yes.

Q. Okay. Were you drafted or did you — did you enlist?

A. Well, I actually had a draft notice, but I enlisted.

Q. Okay. Where did you go for basic training, sir?

A. Orlando, Florida.

Q. And how long was basic training?

A. Eight weeks.

Q. And where — what was your next station — where were you stationed next after basic training?

A. Newport, Rhode Island.

Q. And what were you doing in Newport, Rhode Island?

A. I was aboard a ship.

Q. So you went right from basic right onto — onboard ship?

A. Yes.

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Q. Okay. And what ship were you assigned to, sir?

A. USS Voge.

Q. V-O-G-E?

A. Yes.

Q. What kind of ship is the USS Voge?

A. At that time, it was classified as a destroyer escort. Classification changed in later years to a fast frigate.

Q. Was — did at this time change while you were on the ship?

A. No.

Q. How long were you aboard the USS Voge?

A. From ‘69 to ‘71.

Q. Did you have any specialization aboard ship? What was your — what were your job duties on the ship?

A. At that time, I was a — I went aboard as an E2. And it's basically, ship maintenance.

Q. And what was your title? Were you a bosun?

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A. Seaman apprentice at that time.

Q. Okay. So you would have been on — was it about — well, what year or what month did you get onboard ship, if you remember, or what — what time of the year, what season was it?

A. It was in the summer, July, I believe.

Q. July.

How long were you — do you know what month you left the ship?

A. No. I really don't.

Q. Okay. So would it have been about — about two years you were onboard the ship?

A. Just about. Just about.

Q. Okay. When you say you performed ship — were you a — I thought I saw a BM2. Is that a boats —

A. Yes.

Q. — boatswain?

A. Boatswain's mate, yes.

Q. Boatswain's mate?

A. Yeah.

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Q. Did you have a primary location where you were stationed to perform your duties onboard the ship?

A. No. It was throughout the ship, maintenance throughout the ship.

Q. Okay. So what kind of maintenance were you doing onboard the ship?

A. Painting, chipping paint, repairing rust spots, general cleaning, maintaining the anchor system. We also at that time were standing watches on the bridge, steering the ship at sea, standing lookout watches.

Q. Is this all above deck?

A. Some below deck.

Q. Okay. Where were you below deck?

A. As low as the forward anchor, anchor chain locker, which is the very bottom of the ship, and as far aft as the after steering compartment.

Q. Okay. Did you ever have any duties in any of the engineering spaces aboard the ship?

A. Not at that time.

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Q. Okay. So in 1969, sir, was there — how often would you be below deck versus up above deck, if you can estimate?

A. Probably half and half.

Q. Do you know the USS Voge, do you know when that — do you know when it was constructed?

A. No, sir.

Q. Do you know if it was used during — was it a World War II ship?

A. No, it was not World War II, I know that.

Q. Okay. Were there — when you were below deck, were there insulation on pipes running through the ship?

A. Yes.

Q. Okay. Did you ever have to work with any of that?

A. No.

Q. Were you ever below deck when the ship was on a training exercise or anything like that?

A. Yes.

Q. Okay. What kind of guns did the

Page 40

ship have?

A. That ship had five-inch 38s, and ASROC.

Q. I'm not familiar. What's an ASROC?

A. Anti-submarine rockets.

Q. Okay. Thank you.

When those guns were fired, did that — the whole ship shake?

A. Yes.

Q. How about when the ASRAC —

A. ASROC.

Q. — ASROC was fired — sorry. You can tell I never served in the Navy — did that cause any vibrations in the ship?

A. It caused some, but not as much as the guns.

Q. How often were you aboard that ship for that almost two years you were there where you were below deck and the guns were fired?

A. When the guns were fired, I was below deck all of the time, except for when I got reassigned to one of the gun mounts. And

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the latter part of my career onboard that ship, I was assigned to the forward gun, five inch 38. So I wasn't below deck then. I was on deck in the gun mount.

Q. Okay. So almost the — in the almost two years you spent there, how much time would you have been assigned to the gun mount versus below deck? Was it half and half or —

A. No.

Q. — more below deck?

A. Doing — for the gun mount time, I was only — only probably six months out of the time I was there I was in the gun mount. The rest of the time I was below deck when we fired the guns.

Q. Okay. When — when the guns were fired and you were below deck, that — you'd see dust and that sort of thing come off the ship and off the pipe covering and off the different pieces of equipment that were down below?

A. Yes.

Q. Would you have breathed that

* * *

Page 46

A. Guard.

Q. Guard?

A. Guard.

Q. G —

A. G-U-A-R-D.

Q. Did the tag say anything other than Guard and asbestos?

A. It had the — where it was made. A series of numbers too. I couldn't remember the numbers.

Q. Okay. Fair enough.

How long would a pair of gloves last?

A. I have no idea. I know they lasted the whole time I was aboard.

Q. Okay. Were these gloves dusty at all?

A. Yes.

Q. How — how would you — how would they create dust?

A. You — it would create dust when you put them on, and even when you take them off it would create dust. When you simulate opening a hatch, you had to use those gloves

Page 47

to open that hatch so you wouldn't get burned. And the minute you touch it, you know, touch that handle and start operating, dust would come off of it.

Q. Okay. Other than possibly the insulation onboard the ship and the gloves, do you believe you had any other exposure to asbestos aboard the USS Voge?

A. Not that I know of.

Q. What was the next ship you were assigned to, sir?

A. I went from the Voge to the USS Davis.

Q. And that was in '71?

A. Uh-huh.

Q. And —

A. Yes.

Q. Sorry.

A. Yes, sir.

Q. And how long were you aboard the Davis?

A. Approximately two years.

Q. So until about '73?

A. Well, actually, it was less than

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that. It was actually — I left — I left the Davis in '72.

Q. Okay. And what kind of ship is the USS Davis?

A. It's a destroyer.

Q. And what was your title aboard the USS Davis?

A. I was a BM2 then, boatswain's mate.

Q. Okay. Did you have the same general duties as you had aboard the USS Voge?

A. With the exception of in a supervisory position at that time.

Q. Okay.

A. And was added to — to the job title as a rigger. We did a lot of rigging aboard the ship.

Q. Can I — I'm sorry, Mr. McAfee —

A. McAfee.

Q. — sorry, let me back up a step. I just thought of something about the USS Voge.

While you were aboard the USS

Page 49

Voge — and I'll try and let you know when I'm switching gears — did the ship ever go into dry dock for any overhauls?

A. Not while I was aboard, no.

Q. Okay. Back to the Davis.

A. Okay.

Q. So your duties were similar, except that you were — you're more supervising other younger sailors?

A. Yes.

Q. Okay. So you would have done general cleaning, maintaining the anchor, you stood watch, were steering the ship, all those sorts of duties?

A. Yes.

Q. Again, were most of those above deck?

A. The rigging part —

Q. Well, let me rephrase that. I apologize.

Were at least half of those above deck?

A. Yes.

Q. Okay. I apologize for – go

Page 50

ahead, the rigging part.

A. The rigging part, most of the rigging part was done below deck.

Q. Okay. And what would you be rigging? Like —

A. If the engineers had to work on engines or something, they would — and they had to remove a part, we would have to go in and rig that part out of its position for them to — to repair so they could do the work on them.

Q. Okay. So this would have been in the engineering spaces?

A. Engineering spaces sometimes.

Q. Okay. How much of your work was rigging versus the other work you did?

A. Probably the rigging was probably one third of the — the work. Two-thirds was the other work.

Q. Okay. Is it fair to say that as a BM2, the non-rigging work would have — you would have not been in — if that makes any sense. As a BM2, you would have not been in the engineering spaces other than when you

Page 51

were performing rigging work?

A. Yes.

Q. Okay. What kinds of equipment did you have to help rig up to — to move?

A. Compressors, pumps, gyros, engines, electronics.

Q. And why would these pieces of equipment need to be moved?

A. If they were doing repairs on them, it depends on what they were taking out, you know. If they had to be separated — if the engine had to be separated from a pump, we had to rig — we had to rig it away from that — had to rig the pump away from the engine so they could repair it.

Q. Okay. If this — while this work was being done, was the ship underway or was it in port?

A. Sometimes it was underway; sometimes we did it in port. Depends on when it happened. If it happened at sea, while we were at sea, then naturally, we would do it while we were at sea if it had to be done, if

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it was something that could not wait until we got back in port.

Q. Okay. So if it was an emergency, you would do it at sea; otherwise —

A. Yes.

Q. Sorry.

A. I'm sorry.

Q. No. It's all right.

— otherwise you would wait until you got back to port to do the repairs?

A. Yes.

Q. Do you — what kind of repairs were done on these pieces of equipment, if you know?

A. Well, I know some of it was repacking impellers; some was pulling the heads off of a diesel engine; replacing gaskets; I know a couple of times, they were replacing pistons.

Q. Okay. And how would it work, sir? Would you go down there, rig the piece of equipment up, have it moved, and then leave while the repairs were done and then come back and put it back in place?

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A. It depends on how long it was going to take to do the work. In some cases, we — we stayed because the danger of where — the part that we rigged off, we couldn't stabilize it. We'd have to be there to stay and make sure it didn't get in the way of anybody else.

Q. Okay.

A. And in some cases, we could rig it off and place it in a different place and then we could leave and then come back.

Q. All right. Do you believe any of the work you did as a rigger would have exposed you to any asbestos?

A. Not aboard the Davis.

Q. Okay.

A. In other places, other — other ships it was.

Q. Later in your career?

A. Yes.

Q. Okay. We'll get there.

Okay. The Davis, were you onboard that ship when the guns were fired during exercises?

* * *

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A. Yes.

Q. And then sweep it up?

A. Yes.

Q. With just a brush and a — with a broom and a — and a dust pan?

A. Yes.

Q. Okay. Was that a dusty process?

A. Yes.

Q. Okay. And were you present when this work was done?

A. Yes.

Q. Okay. And did that happen pretty regularly?

A. Especially in Vietnam, yes.

Q. Okay. And you would have breathed that dust when you were supervising the men?

A. Yes.

Q. How long was the Davis stationed in Vietnam?

A. The ship was actually there until I think it was — I believe March or April of ‘73. However, I — I got transferred in October of ‘72.

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Q. Okay. So you left the Voge around approximately July and you were aboard the Davis in approximately October of ‘72?

A. I left the Davis.

Q. I’m sorry, right.

And you were aboard in approximately July of ‘71?

A. Yes.

Q. And it was over there in Vietnam the whole time?

A. Yes.

Q. Okay. Where was the port? What was the home port for the Davis?

A. Newport, Newport, Rhode Island also.

Q. Was — the time you were aboard the Davis, did it undergo any overhauls?

A. We did minor overhauls, but we were not in dry dock.

Q. Okay. Where was that overhaul?

A. In Boston Naval Shipyard.

Q. When you say a minor, what was done to the ship?

A. They reconstructed the – the

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superstructure. It was a — the superstructure at one time was — was open. The main deck was open all the way up and down the superstructure. They enclosed part of it all the way down to — from one part of the superstructure all the way down on the main deck up to the 01 level.

Q. Okay.

A. They enclosed all that area, so it was not exposed to the weather like it used to be. They also added the — the five-inch 54 guns and the ASROC and re — and moved the torpedo tubes from the main deck up to the O2 level. So we didn't need to go in dry dock to do that, but they...

Q. Was any work done in the engineering spaces during this minor overhaul?

A. Not that I was involved in.

Q. Okay. Do you know if your — what was your — did you have any role at all while the ship was being overhauled?

A. Yes. We still had to do our normal routine. We still had to maintain all

Page 61

the parts of the ship that we did. Our maintenance work continued. When it went on, we still had to do that.

Q. Okay. Were you involved in any rigging of any of the equipment during the overhaul, or was that all —

A. That — that was done by shipyard workers at the time.

Q. Okay. So in October of '72, you leave the Davis and you go to the USS Yosemite?

A. Yes.

Q. And what kind of ship is the USS Yosemite?

A. It's a destroyer tender.

Q. And how long were you aboard that ship, sir?

A. Until October '74.

Q. So two full years?

A. Yes.

Q. And where was the home port for the Yosemite?

A. Mayport, Florida.

Q. Was that — was that ship

Page 62

involved in any combat?

A. No.

Q. Did you have similar duties aboard the Yosemite as you had aboard the Davis?

A. Yes.

Q. Okay. So you were supervising younger sailors?

A. Yes.

Q. Okay. Did they perform the same duties you previously described?

A. Yes.

Q. I'm trying to short circuit it.

Did you work as a rigger aboard the USS Yosemite?

A. Yes.

Q. How much of your time was spent being a rigger versus your other duties?

A. About the same, rigger, about one third.

Q. Okay. Do you believe any of your work as a rigger would have exposed you to any asbestos?

A. Yes.

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Q. Okay. And can you tell me how?

A. Well, one instance I — I distinctly remember, we were — we were rigging a small generator from its — from its position. And we had to — the beam clamps up, the chain fall rubbed up against some steam piping, and it emitted dust. We believe that it was asbestos.

Q. Okay. Was this below deck?

A. Yes.

Q. Okay. And just so I understand what you're saying, you were removing a generator, a smaller generator?

A. Smaller.

Q. And some of the chaining you used to move the — to rig the generator rubbed up against some steam pipes?

A. Yes.

Q. Did that just brush up against it, or did it knock the insulation off?

A. It actually rubbed a slot right in.

Q. Oh, okay.

A. Yes. And it ripped — ripped

Page 64

part of the lagging, opened it up.

Q. Okay.

A. To where it emitted dust.

Q. Okay. And how big an area were you in when this happened?

A. It was actually a large area. It wasn't confined, the space — the part of the engine — we were in the after part of the engine room, where we were.

Q. Were you — how close were you to the lagging when it ripped open and the dust was emitted?

A. It was right above us.

Q. Okay.

A. Right above us.

Q. Did you have to clean up that pipe covering?

A. Yes.

Q. And, sir, when I say you, I mean did your crews have to clean that up while you were present?

A. Yes.

Q. I'm sorry. I should be more specific.

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Did they use the — did your crews use foxtails and dust pans?

A. Yes.

Q. And that made dust?

A. Yes.

Q. And you were present?

A. Yes.

Q. And you would breathe that dust?

A. Yes.

Q. All right. Do you know who made the pipe covering? Do you remember any names of any of the manufacturers of any of the pipe covering onboard any of the ships you served on?

A. No, sir, I don't.

Q. Okay. Other than that one instance involving the pipe covering while you were rigging that small generator, do you believe any other time you were working as a rigger you were exposed to any asbestos?

A. Not aboard the Yosemite.

MR. PRESENT: Okay. Can we take a short break now for a little bit?

MR. ADAMS: Sure.

* * *

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on your crew?

A. Sixteen.

Q. In October of '74, you moved to a different ship?

A. No. I went to recruiting duty.

Q. Oh, okay.

A. And left ashore. I was onshore.

Q. And how long were you involved in the recruiting duty in Philadelphia?

A. Three years.

Q. So until approximately '77?

A. Yes.

Q. Do you know what month you ended the recruiting duties?

A. Must have been October.

Q. Okay.

A. Of '77.

Q. Okay. And were you living on — in base housing at the time you were doing recruiting?

A. Part of the time I was. And — well, when I met my wife, we moved out of base housing to Clayton.

Q. Okay. And we already talked

Page 75

about Clayton, I think.

A. Right.

Q. All right. Do you believe you had any exposure to asbestos while you were performing your duties as a recruiter from October of '74 through October of '77?

A. No.

Q. And then were you reassigned to a new ship in October of '77?

A. No. We went — I went to Guantanamo Bay, Cuba.

Q. And what were you doing in Guantanamo Bay, Cuba?

A. I was a tug master.

Q. And what's a tug master?

A. The skipper of a tugboat.

Q. Did you have any training for that?

A. Yes.

Q. Okay. Where did you do that training?

A. In Guantanamo Bay, Cuba.

Q. Okay. Was it basically on-the-job training?

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A. Yes.

Q. Okay. How long were you assigned as a tug master at Guantanamo Bay?

A. The full-time I was there, from '77 to '80.

Q. Do you know what month in 1980?

A. I know I left in October of '80.

Q. Okay. So was it three full years?

A. Yes.

Q. And what were your duties as a tug master?

A. Well, I was responsible for assisting the training — the ships that came down for training. That's a training base. When they came down for training, assisting them to and from the docks and maintaining that tugboat was my main thing. I had a crew of eight people. And we had to do it all.

Q. Okay. Let me back up a step, so I understand. The tugboat basically helps the ships get into port and out of port?

A. Yes.

Q. Okay. So that's what you meant

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by assisting in —

A. Right.

Q. All right. And it was you and eight people aboard the ship?

A. Yes.

Q. What kind of — you said you had to maintain the ship?

A. Yes.

Q. Okay. What kind of work did you have to do on the tugboat?

A. Rigging. We had to actually help repair engines or any — any component that went down aboard that tug, we had to do it ourselves.

Q. Okay.

A. It was just eight people, one engineer. And so we all had to do the work to do that. We also had to do the regular cleanups, the regular maintenance of the — of the rust or anything that broke, any engine parts that broke, any repairs to the engines, to the generators, to the pumps, to the brakes. We had to do it all.

Q. Okay. Do you believe any of your

Page 78

work exposed you to any asbestos?

A. Yes.

Q. Okay. And how so, sir?

A. Well, when we — as I was explaining before, we had to do all of the work.

Q. Okay.

A. The engineer — we were under the guidance of the engineer that was there. But he explained to us and showed us how to do things. For instance, repacking the impeller that was leaking from a freshwater pump. We had to — we had to take the old packing out, put new packing in. The brakes on the shaft, it had air — air brakes on that shaft. On the tugboat, when you stop the engine, you don't want it to keep turning, you don't want the propellers to keep turning. So it's equipped with an air brake. Air brakes have to engage, and we have to work — make sure those brakes work all the time. So we had to replace the brakes. One time we replaced a piston. We replaced generators, air compressors. The air compressors are the

Page 79

ones that would fill up the bags for the brakes and ran the horn on the ship. We had to — we had to do all of that work ourselves.

Q. Okay. Let me take them one at a time. Okay?

A. Okay. Sure.

Q. And I'll ask you about each one.

When you say repacking the impeller, was that the drive shaft for the ship, or is that for a pump or —

A. That's for — for a freshwater pump.

Q. Okay. And what was the freshwater feeding into?

A. Fresh — into supply on that — on that ship.

Q. For drinking water?

A. Yes.

Q. Okay.

A. For drinking water.

Q. So it was for potable water?

A. Yes.

Q. Okay. And how often do you have

Page 80

to repack that impeller? Was it a one-time occasion, or did it happen more than once?

A. It happened more than once.

Q. Okay. How many times?

A. Not on the same freshwater pump, but probably during the three years, I probably replaced packing in that thing probably five times, you know, different — different ones. We had two freshwater pumps onboard. So it wasn't the same one that went down all the time.

Q. Okay. Were those pumps ever replaced or was it the same two pumps the entire time?

A. Same two pumps. We didn't replace the pumps.

Q. So out of both — in taking into consideration both pumps, you changed the packing five times total?

A. Approximately five times.

Q. Approximately five times. Fair enough.

And — and this is for drinking water?

Page 81

A. Yes.

Q. So it's room temperature, or is it chilled or — the water?

A. It's — they did have a chilling factory on there, but it didn't always work and we didn't care about that.

Q. Sure.

A. We just wanted to make sure we had water pumping to the water fountains where we could get water.

Q. All right. So this isn't a high heat or — application?

A. Not high heat, but it was — it was hot, yes.

Q. What was hot?

A. The — you mean the water that's coming through that you mean?

Q. Yes.

A. Because — yes. Yes. It's from — we have a potable tank onboard.

Q. Okay.

A. And that's where the water was, in this tank. And the pump pumped the water from that tank to reservoirs for — for us.

* * *

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A. No.

Q. Do you know who made the gasket that was put back on?

A. No.

Q. Okay. I think we talked about all the ways that you initially told me you believe you worked on the tugboat that would have exposed you to asbestos. Is there any other way you can think of working on that tugboat that would have exposed you to asbestos that we haven't already spoken about?

A. No.

Q. How — I mean, you were — were you the captain of the tugboat?

A. Yes.

Q. Okay. And I mean, how often would you need to do repair — any kind of repairs? I mean, was that something that happened daily, or was that something that happened once a week or —

A. It happened an awful lot in the three years. That's all I can say. It happened a lot. It was always something

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going down on that bottom. As I — as I explained before, this was — this was a — this was a training base. Every morning, 6 o'clock in the morning, 15, 16, 17 ships get underway. So you have to get them out to sea. And then they'd come back again at 6 o'clock at night, we'd get them back in. So those boats get a lot of workout. And things happen, and you have to keep them up or else the ships don't move.

Q. Okay. Fair enough.

A. Sometimes we work all night long sometimes just to get these things going.

Q. So it would be ready for —

A. So it would be ready —

Q. — the next day?

A. — the next day.

Q. Okay. Fair enough.

So we left off in October of '80 when you left Guantanamo Bay.

A. Right.

Q. Where were you assigned when you left?

A. When we left Guantanamo, I went

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to — let's see. I went to the — to the Butte.

Q. Butte, B-U-T-T-E?

A. Yes.

Q. What kind of ship is the USS Butte?

A. Ammunition ship.

Q. So does that mean it's a ship that would supply other ships in the Navy with ammunition —

A. Yes.

Q. — for their guns?

A. Yes.

Q. Okay. And how long were you aboard the USS Butte?

A. Eighteen months.

Q. So October 1980 through April '82?

A. Yes.

Q. Wait. No. That would be — oh, no, that's —

A. Yeah. Because I left there and I went to Philadelphia Navy shipyard on another tugboat.

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Q. Okay. So what were your duties aboard the USS Butte?

A. I was in charge of the second division, which was responsible for the rigging of the transfer stations where we would transfer the ammunition.

Q. Okay. So you would be responsible for getting the ammunition rigged up so it could be moved from the ammunition ship to whatever ship you were supplying?

A. Yes.

Q. Did you —

A. Staging it, staging it and the maintenance on the transfer station.

Q. Well, what's a transfer station?

A. It's — it's a lift that would lift up, lift ammunition up, and we send a wire across to the other ship. And the ammunition travels on that wire across to the other ship. There's a control station that — just like a crane operator would operate to hoist it, to send it across, and to bring it back.

Q. What kind of maintenance was

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required for the area you worked in?

A. We had to maintain the wire. That wire was under a lot of tension, so we had to keep it rust-free. And we had to repair the — maintain the — the lift mechanism. We had to repair, maintain the station where the operator would sit, make sure all the gears worked and everything worked there electronically. And we also had to make sure that the station area was clear, safety — safety lines were put up, where nobody could — could enter the station while we were in operation.

Q. Okay. Do you believe any of your work aboard the USS Butte in charge of the second division exposed you to any asbestos?

A. I can't say for sure, but I know it had a braking system on it that emitted dust.

Q. Okay. On the — on the —

A. On the tower. The tower had a braking system on there that emitted dust. But I never had to do anything with that, with the — with the repair of that. This

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was another ship that had the people to do that, so we didn't have to do it. The only thing I was required to do was rig the station, send the stuff across, and bring it back, and get — get the ammunition staged. But I know that braking system did emit dust. So I don't know what kind of — you know, I can't say for sure.

Q. Okay. And that's fine.

Is this braking system located on the tower that —

A. Yes, on the tower.

Q. Okay. So it's up above the ship?

A. Right. It runs like a worm gear.

Q. Oh, I see.

A. Up and then it got — when you lift the tower up itself, it slides between an opening like and the tower slides up between there. And when you want to stop it, it brakes — the brakes move into it to stop the tower at the height that you want it to be.

Q. Okay.

A. You had to put it at different

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heights, depending on what kind of ship you were sending to.

Q. I see.

So where were the brakes, were these down close to the deck or were these up, higher up?

A. You had — you had — you had two space. You had one at — two at — you had the brakes at the bottom and you had the brakes at the top, at the top, by the tower. Now, even though — even though you may extend higher, but the braking system stopped at the height of the tower.

Q. Okay. And do you know who made those brakes on that system?

A. No, sir, I don't.

Q. Okay. Even though you didn't have to do the work, were you ever present when anybody else did any repairs to the brakes?

A. No, sir.

Q. Okay. Would the dust be made each time you had to use the brakes?

A. Every time that thing stopped,

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dust would emit, yes.

Q. All right. And how many people — you said you were in charge of this — the second division?

A. Second division, yes.

Q. How many people were you in charge of?

A. Thirty-two.

Q. Thirty-two.

And were — all 32 people have some kind of job to perform whenever ammunition was being transferred?

A. Yes. Unless we were only running one station. If we were running two stations, then I needed everybody.

Q. Okay.

A. If we were only running one station, only half of them.

Q. I see. So 16 person —

A. Yes.

Q. Sixteen —

A. Per station.

Q. Per station, right.

All right. Actually, your —

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have we — all right. So then other than the brakes, is there anything else that you believe may have exposed you to asbestos aboard the USS Butte?

A. No.

Q. The next ship on this document, which your plaintiff — which your attorney was kind enough to remind me I had sitting in front of me, was the USS Nitro. Was that the next ship you served on?

A. Right. Right.

Q. It shows from 1986 to 1989 —

A. Uh-huh.

Q. — is that correct?

A. Yes.

Q. So what did you do between 1982 to 1986?

A. I was at the Philadelphia Naval Shipyard.

Q. Okay.

A. Running another tugboat.

Q. Do you remember, in April or May of '82 you left to go back to — sorry, you didn't go back — you went to the

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Philadelphia Naval Shipyard. What month did you leave in '86? Do you know?

A. I believe it was May.

Q. So you would have been about four full years at — running a tugboat at the Philadelphia Naval Shipyard?

A. Yes.

Q. Were you again a captain?

A. Yes.

Q. Okay. What was the name of the ship?

A. It was YTM-801 Commodore.

MR. MIRABILE: I'm sorry, could the court reporter read that back.

(Whereupon, the court reporter read back the record as requested.)

BY MR. ADAMS:

Q. Was Commodore the name of the ship?

A. Yes.

Q. All right. Did you have duties similar to the duties you described when you were at Guantanamo Bay?

A. Exactly the same.

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Q. Okay. Did you ever have to replace packing on impellers aboard the Commodore?

A. I don't remember doing that.

Q. Did you ever have to change head gaskets on the compressors aboard the commodore?

A. Yes.

Q. Was it the same process?

A. Yes.

Q. Was it the same — was it the same kind of ship? I mean the dimensions of the head gaskets were the same and everything —

A. Yeah.

Q. — or is it slightly different?

A. The head gaskets were the same, but this is an older — older tugboat than the 820, and a smaller one. This one's — this one was only about 90 foot long; 820 was 110 foot.

Q. Okay. How often — did you personally remove the head gaskets from — from the compressors aboard the Commodore?

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A. Same as — just like we did on the — on the other one, yes.

Q. Okay. Was this something that happened often or not as frequently as aboard the other tugboat?

A. I was actually there longer than I was the other one. So this one was many times too. There's many times. Because the system — the whole system on this older tug was — was manufactured by the shipyard personnel, because this tug didn't really have all the modern conveniences as 820 had. It was a lot older. So they had to put air brakes on. They had to put the remote throttles on. All that had to be put on. They put the new — new compressors on because of the shaft brake. It didn't — the old one didn't have that. They had to put all that on. So that was all manufactured by the shipyard. And then they turned it over to us to maintain. So we had to maintain.

So the first — first year or so we didn't have a whole lot to do on it other than the regular maintenance. After

* * *

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where we could avoid stuff like that. The commodore was a lot smaller. And sometimes you couldn't avoid the chain fall rubbing against something.

Q. Okay. When you say chain fall, is that the rigging, the chains used for rigging different equipment?

A. Yes.

Q. Do you know if the pipe covering aboard the Commodore contained asbestos?

A. No, sir.

Q. When was the — when was the tug overhauled that it had all this new stuff added, the air brakes and the remote, if you know?

A. See I — I got there in '86, so — no. I got there in —

Q. '82.

A. — '82. It was — it was in — in dry dock when I got there so —

Q. Okay.

A. — so they were in the process of working on it then.

Q. So it got an overhaul in 1982 at

Page 139

some point?

A. Some — somewhere around that time.

Q. Okay.

A. I know I took it out for the first test run.

Q. Okay. So we've got the gaskets and then possibly the — the pipe covering. And that's — any other ways you believe you may have been exposed to asbestos aboard the Commodore during the four years you were aboard?

A. No.

Q. I think the last ship we have, sir, is the USS Nitro?

A. Uh-huh.

Q. What kind of ship is that?

A. It's another ammunition ship.

Q. Did you board in — was it May, May of ‘86?

A. Yes.

Q. Until 1989?

A. Yes.

Q. This document here has April of

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1989. Is that accurate?

A. Excuse me. Let me — let me back up.

Q. Oh, of course.

A. Because I went to — I went to a school for eight weeks prior to going to the Nitro.

Q. Okay. What kind of school did you go to?

A. Senior enlisted academy, Newport, Rhode Island.

Q. And what were you doing at the senior enlisted academy?

A. Going to school there. It was a —

Q. Sure. I'm sorry. But for — what were you learning? What were you being trained for?

A. Trained — we took — had courses in like defense economics, leadership, public speaking. It was — it was geared to senior enlisted. This is the time when I made senior chief and we had to — you go aboard a ship, you'll be the senior enlisted aboard

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and you'll be the liaison between the captain and the crew.

Q. Gotcha, all right.

Would you have had more managerial-type responsibilities at that point then?

A. Yes.

Q. Okay. What were you — what — so you were senior chief aboard the USS Nitro?

A. Yes.

Q. Okay. And what — what kind of duties did you have aboard the Nitro?

A. I had — like I say, I was the — I was the senior enlisted aboard. I was the — the go-between between the captain and the crew. I was the morale booster. I was the one to keep the crew in line. I controlled the senior — the professional development board, where young sailors would come before me and my board to - - to make rank. I went — I assisted the XO every day, you know, with habitability.

Q. What's habitability?

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A. Habitability as far as cleanliness of the ship.

Q. Okay. Do you believe any of the duties you had aboard the USS Nitro exposed you to any asbestos-containing products?

A. No, I didn't. I was strictly management at that time. I was away from the hands-on work.

MR. ADAMS: All right, sir, I need to take a couple-minute break. Are you okay with that?

THE WITNESS: Yes.

MR. ADAMS: We'll come back.

We're at a good spot to break.

THE WITNESS: Sure.

(Whereupon, a brief recess was taken.)

(Whereupon, Exhibit Nos. McAfee-1, McAfee-2, and McAfee-3 were marked for identification.)

BY MR. ADAMS:

Q. Mr. McAfee, have we now talked about all the ways you believe you were exposed to asbestos while you served in the

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U.S. Navy?

A. Yes.

Q. And, sir, I assume you were honorably discharged?

A. Yes.

Q. And what — what jobs did you work after you left the Navy? Did you have any jobs?

A. Yes. I worked for B.F. Goodrich. I worked for the U.S. Post Office. I worked for a contractor in the naval shipyard called Global Associates. And I worked for the Department of Veteran Affairs, State of New Jersey.

Q. Okay. Let's take those one at a time, sir.

A. Okay.

Q. Was B.F. Goodrich the first job you held after you left the Navy?

A. Yes.

Q. Okay. And where were you working?

MR. PRESENT: You want the physical location? Is that –

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MR. ADAMS: Yes, or town.

THE WITNESS: The plant — Pedricktown, New Jersey.

BY MR. ADAMS:

Q. Fredericktown?

A. Pedrick, P-E-D.

MR. PRESENT: It's P-E-D-R-I-C-K-T-O-W-N, right?

THE WITNESS: Yeah.

BY MR. ADAMS:

Q. And what did you do for B.F. Goodrich?

A. I was a laborer.

Q. What was in Pedricktown? What kind of facility?

A. It was a facility that made body side molding for cars.

Q. And how long did you work there as a laborer, approximately?

A. Not very long. I think I worked maybe — maybe — maybe six months at the most.

Q. Okay. Do you believe you were exposed to asbestos working as a laborer at

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the B.F. Goodrich plant?

DEFENSE COUNSEL: Objection; lack of foundation and personal knowledge.

MR. ADAMS: You can answer, sir.

MR. PRESENT: Don't pay any attention to that.

THE WITNESS: I have no idea.

BY MR. ADAMS:

Q. Mr. McAfee, that objection is to my question, not to you or any answers you may give. Okay?

A. Okay.

Q. And was the next position then you had with the U.S. Post Office?

A. No, I'm sorry. I missed something.

Q. Okay.

A. Kaytron, I worked for a company called Kaytron.

Q. Okay. And what's Kaytron?

A. It's a assembly plant for feeders.

* * *

IN THE COURT OF COMMON PLEAS
PHILADELPHIA COUNTY, PENNSYLVANIA

\- - -

KENNETH E. McAFEE and SHIRLEY McAFEE, h/w	:	OCTOBER TERM, 2013
vs.	:	
20th CENTURY GLOVE CORPORATION OF TEXAS a/k/a Guard Line, Inc., et al.	:	NO. 205

\- - -

FRIDAY, OCTOBER 25, 2013

VOLUME II

\- - -

Continued oral deposition of KENNETH E. McAFEE, was held at Courtyard Glassboro-Rowan University, 325 Rowan Boulevard, Glassboro, New Jersey, commencing at 10:51 a.m., on the above date, before Deborah A. Brazukas, a Registered Professional Reporter, Certified Shorthand Reporter of New Jersey, License No. XI 01938, and Notary Public.

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KENNETH McAFEE, after having been previously duly sworn, was examined and testified as follows:

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EXAMINATION

\- - -

BY MR. HEXSTALL:

Q. Good morning, Mr. McAfee. How are you?

A. Just fine, sir.

Q. Can you hear me okay?

A. Yes.

Q. Okay. Same instructions as yesterday. If there's ever anything, let me know. And if you don't understand a question, just let me know and I'll try to rephrase the question. Okay?

A. Okay.

Q. I want to start off today and ask you some questions about your time in Guantanamo Bay. All right?

A. Okay.

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Q. Now, you were there from 1977, I think you said, until October of 1980?

A. Yes.

Q. And do you know what month in '77 you started?

MR. PRESENT: No, it's not '37. He wasn't born until 1948. So it couldn't have been 1937.

THE WITNESS: I thought he said '77.

MR. PRESENT: Oh, '77, I'm sorry.

BY MR. HEXSTALL:

Q. Okay. Do you know what month in 1977 you started?

A. I'm not sure, but I think it was May 1977.

Q. And I thought you referred to it as a training base. What type of training was taking place there?

A. That's the fleet training group. That's where they train ships' crews for deploying.

Q. Okay. And did you participate in

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that training as well?

A. I did when I was on other ships. But I was not there in the training capacity at the time.

Q. Okay. When you were there for that three-year period, your responsibility was as the skipper for the tugboat?

A. Yes.

Q. Okay. And on that tugboat, there was one engineer, yourself, and eight crew members?

A. Six crew members. Including the two of us —

Q. Six crew members?

A. Yeah, the — including the two of us, the total crew was eight.

Q. Okay. And how many hours per day were you actually on the tugboat?

A. Maybe 12, 13 hours a day.

Q. Okay. And how many days a week?

A. Depending on the training. Sometimes the training went through the weekends. If not during the weekends, it would be like Monday through Friday.

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Q. And your crew's goal and the engineer was to get the ships in and out of port, correct?

A. Yes.

Q. And in that capacity, what were your specific duties as it related to getting the ships in and out of the port? And I'm not talking about working on equipment here. Just in terms of getting the ships in and out, what did you specifically have to do?

A. I was the master of the tug.

Q. Okay. And in being a master, what were you responsible for doing?

A. Steering and navigating the tug.

Q. Okay. Other than steering and navigating, did you have any other responsibilities in getting the ships in and out of port?

A. Not in getting the ships in and out of port. I supervised the — the rest of the crew.

Q. Okay. And what were the rest of the crew doing?

A. They handle all the deck lines,

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the lines that we connect to the ships, where they — they handle those when we were in operations.

Q. Okay. And that's basically what you were doing for 12 or 13 hours each day?

A. Negative. We didn't stay — we didn't operate with the ships all day. We took the ships out and then we came back and did our maintenance on the ship, on the tugboat.

Q. Okay. On average, how long would it take for you to bring a ship in, if everything went smoothly?

A. Forty-five minutes to an hour per ship.

Q. Okay. And how long to get a ship out of port?

A. It was less time to get it out of port. Probably about 20 minutes.

Q. Okay. And were there ever times when it took longer to get it out of port?

A. If there was —

Q. Or was that pretty —

A. — if there was other movement

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going on at the same time, it slowed us down, because it was not just one ship moving at a time. Sometimes there was three or four ships moving at a time.

Q. Okay. And were there ever occasions where it took longer than 45 minutes to an hour to bring a ship in?

A. Yes.

Q. What would be the — the most amount of time that you can recall that it took to bring a ship in?

A. That's hard to say. I can't — can't really pin that down on how long it would take. Because there was all kinds of things that happened. And — and I really wasn't timing myself to see how long it would take us to do that. If — if one ship that was ahead of us had problems getting into the port, we had to stand by and hold onto the ship until they clear. So —

Q. Okay.

A. — it could vary.

Q. And in terms of the number of ships, I think you told us yesterday there

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were about 16 ships each day that you had to do this for?

A. Sometimes we had as many as 16 ships; not all the time.

Q. What was the average? What was the least amount of ships you would have in a day?

A. The least amount?

Q. Yes.

A. One.

Q. So there were some days where you only had one ship; other days where you had up to 16?

A. Yes.

Q. Okay. In terms of the name of the ship, it's the Wanamassa; is that correct?

A. Yes.

Q. And it's the YTB-820, correct?

A. Yes.

Q. And you were on that same tugboat that entire three-year period?

A. No. I —

Q. What other — what other tugboat

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were you on during that three-year period in Guatemala — Guantanamo Bay?

A. There was another one that was a YTM, but I don't remember the number on it. I think it was 543, but I can't remember. I was only on that a short period of time.

Q. Okay. About how long were you on there?

A. I don't remember. It was just a short period of time that I was on it. I was on — spent most of my time on the Wanamassa.

Q. Okay. And I'm just trying to get — when you say short period, would that be a week? Would that be a couple weeks? Can you give me an average or estimate?

A. I — it was more than a month, I know that, but I just don't remember how long it was.

Q. Okay. And all you can remember about that — was there a name for that ship or was YTM-543 all you can remember?

A. It was — YTM-543 was — was the hull number.

Q. And there wasn't a name for that

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tugboat?

A. It probably had a name, but I — I don't remember. I was on it such a short period of time as part of the training to be a tug master. I did the training on that and that's it.

Q. Okay. So that would have been the early part of your time?

A. Yes.

Q. And were you — did you have the same responsibilities on that?

A. No. I was in a training mode. I was there to train.

Q. Going back to the Wanamassa, can you describe — what was the size of that tugboat, the dimensions of it?

A. It was a 440 ton tugboat, 110 foot long, 12 foot shaft — 12 foot screw, stainless steel screw.

Q. And how many different areas were there on the tugboat?

A. (No response.)

Q. Is it easier to give me like a general layout?

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A. It's laid out just like a regular ship. You had the berthing area, you had the engineering spaces, you had a galley, you had the captain's quarters, you had the pilot house, you had a chain locker, you had several storage spaces on there, and all kinds of voids. I just don't really know how many spaces there were.

Q. All right. And what was the age of the Wanamassa?

A. I'm sorry, I didn't understand.

Q. How old was that boat?

A. I don't know.

Q. When you boarded it in 1977, was the equipment already in place or were they still installing new equipment?

A. No. Everything was there.

Q. So when you started in '77, the — the two air compressors that you spoke of were already onboard?

A. Yes.

Q. And where exactly on the tugboat were the air compressors located?

A. In engineering space.

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Q. Were — were both air compressors in that same engineering space?

A. Yes.

Q. And were they next to each other? How far apart were they?

A. Yes, they were. They were right — right next to each other.

Q. And it's my understanding that you were responsible for doing some repairs on the air compressors when they would leak air?

A. No. I was not doing the repairs. I — we assisted because of the short — short amount of people that we had on board. I did most of the rigging and in some cases ripping out packing. Most of the other stuff was done by the engineer. The technical part was done by the engineer.

Q. Okay. So rigging and packing was what you primarily did in terms of repairs?

A. Yes.

Q. But were there occasions when you did work on air compressors?

A. As far as rigging?

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Q. As far as doing any type of repair.

A. Not repair, rigging, yes.

Q. Okay. And in rigging the air pressures — air compressors, what were your responsibilities?

A. If — if the head had to come off, we – I would rig the head off of it, the — set up chainfalls to take that head off. Or if it had — if it had to move forward to remove a shaft, then I would do that. I would rig it, that part. But the technical part, the technical work was done by the engineer. If there was any packing that had to be pulled out, he would let us do that. And he would reinstall.

Q. Okay. And the air compressors, I think you testified yesterday that they ran the brake and air horn?

A. Yes.

Q. And anything else?

A. Not that I'm aware of.

Q. And in your capacity on this tugboat, you were never specifically trained

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as an engineer to do the technical work, were you?

A. No.

Q. You would just assist him if he asked you to if you were short staffed or something like that, correct?

A. Yes.

Q. The air compressors, you told me yesterday — or you told us yesterday that they were four feet by two feet?

A. I just estimated. I didn't — I don't know.

Q. Anything that's happened since yesterday that would change that estimate in your mind or is that still fair?

A. Like I said, I'm just — I'm just estimating, just pretty well guessing. I didn't measure them, and I don't know. They wasn't very big, that's for sure.

Q. Okay. Were they portable air compressors or were they stationary?

A. No, they were stationary.

Q. And what was the shape of the air compressors?

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A. You — you mean if — if it was round —

Q. Were they oval? Were they square? Can you describe the shape of them?

A. They were like — well, elongated, I guess. It was longer than they were — longer than they were wide.

Q. Okay. But the end of them, were they round at the end? Were they square at the end? Were they rectangular or like an oval?

A. I believe it was like — I'm trying to remember. Probably — it was elongated, so it had to be a little rounded off on the ends.

Q. And what were they made of?

A. Metal.

Q. What color were they?

A. Gray.

Q. And were both of these — so I don't have to ask you the same questions twice, were both of the air compressors identical?

A. Yes.

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Q. And how were they powered?

A. By diesel engine.

Q. Do you remember whether or not there was any writing on the air compressors?

A. There was — I know there was tags on it. There was a tag on it that said what kind of compressor it was.

Q. Okay. Where was the tag located?

A. At the base, the base of it.

Q. Okay. And what — what did the tag say?

A. Ingersoll Rand, and it had a series of numbers.

Q. Did it say anything else other than Ingersoll Rand?

A. Not that I can recall.

Q. Do you recall any of the model numbers or serial numbers?

A. No, sir.

Q. Other than the tag that said Ingersoll Rand, was there any writing on the air compressor itself?

A. I believe the top of it said Ingersoll Rand too, I believe.

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Q. Okay. When you say the top of it, where on the top of it did it say Ingersoll Rand?

A. Where the — I guess these were like valves or something, that stuck out of the top of it. I think that's what — some kind of valve was on the top of it. I believe it said Ingersoll Rand somewhere in that vicinity.

Q. Okay. And was the whole word written out?

A. Yes.

Q. Do you remember what color that writing was?

A. The whole — the whole thing was gray, the engine, the whole thing was painted gray.

Q. Okay. The words Ingersoll Rand, though, do you remember what color that writing was?

A. It's — the whole thing was gray, the writing —

Q. The letters were gray as well?

A. Everything was painted gray.

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Q. And painted gray by the Navy?

A. Yes.

Q. Did you ever see any packaging for that compressor itself, the entire air compressor?

A. No.

Q. Were you ever responsible for ordering any parts for the air compressor?

A. No.

Q. At any time during that three-year period, was — were either of those air compressors ever removed as far as you know?

A. No.

Q. Other than the — the head gasket that you spoke about, what other components were on that air compressor?

A. I couldn't tell you. I'm — like I said, I'm not an engineer, I don't know these parts on this thing.

Q. Okay. Fair enough.

Did you ever see any manuals or any specifications for the air compressors?

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A. I saw the manuals, yes. I saw some of the manuals, yes.

Q. Did you ever read the manuals?

A. If the engineer was working on it and he asked me to read something out of it while he was working I would, yes.

Q. Okay. As you sit here today, can you recall specifically what you might have read from any of the manuals?

A. I remember — I think he was repacking valves on there. And I remember the instructions on packing the — packing that valve. Just to say that — I believe it said that he had to use a certain kind of packing. I remember that, yes.

Q. Okay. Yesterday you told us all that you ever did with respect to the air compressors was remove the head gaskets. Now today, you're telling me that you — you read a manual and actually did repacking on the valves as well?

A. I did not say I repacked any valves. I said that's what the manual said.

Q. Okay. But you didn't personally

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do that?

A. No.

Q. Okay. Let me ask you about the head gaskets. Now, I understand this wasn't what your primary responsibility was, but there were occasions where you helped the engineer and removed some head gaskets, correct?

A. Yes.

Q. Did you have to remove anything to get to the head gasket to remove it?

A. Yes.

Q. And what was that?

A. You had to remove the top of the — the top of the — where the gasket was — the gasket was underneath the head, so you had to move that.

Q. And how did you do that?

A. With a chainfall.

Q. How long did that process take to remove the top to get to the head gasket?

A. I don't remember. You're talking about 20, 30 years ago. I don't remember how much time that was.

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Q. All right. Once you were able to get to the head gasket, you said that you used a scraper to get the gasket up?

A. Yes.

Q. What did the gasket itself look like, the appearance of it once you got the — the top off? What color was it?

A. It was a dark color. I guess I could call it either black or gray, dark gray.

Q. Okay. And did you wear any gloves or anything like that when you were working on the gaskets?

A. No.

Q. Did you have to wear a mask or anything?

A. No.

Q. And the only tool that you used to remove the gasket was a scraper?

A. Yes. If it — if it needed to be. Sometimes some parts of it would come right off; sometimes it wouldn't.

Q. Okay. So sometimes you could just manually pick it up with your hand and

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take it off?

A. Not the whole thing. Some parts of it maybe — maybe would come off with your hand.

Q. Okay.

A. Because —

Q. And if you needed a little more assistance, you would use a scraper?

A. Yes.

Q. And how big was the scraper that we're talking about?

A. It was a little wider than a regular putty knife.

Q. And the majority of the time, did you have to use a scraper or could you just pull it out in pieces with your hands?

A. I wouldn't say the majority of the time I had to use a scraper, but sometimes I did.

Q. Okay. And I thought you testified yesterday that when you pulled this gasket material out, it really wasn't a dusty process, correct?

A. I'm sorry, I didn't understand

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you.

Q. You told us yesterday that when you pulled the gasket material out, it wasn't really a dusty process, correct?

MR. PRESENT: Objection; misstates testimony.

But go ahead. You can answer.

THE WITNESS: No, I didn't say it was — it wasn't a dusty process. I said it — sometimes it would be if it popped, you know, if it — if it popped, it would produce dust.

BY MR. HEXSTALL:

Q. Okay. So when you were changing a gasket that popped, that's when dust was produced, correct?

A. Yes.

Q. After you got the gasket material out itself, the engineer would come in and put a solvent on and put the new gasket in, right?

A. Yes.

Q. Now, this gasket material, was it hot to the touch at all?

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A. No.

Q. How long would it take you to actually get the gasket out most of the time, if there weren't any problems?

A. Maybe 15, 20 minutes, maybe.

Q. Now, the air compressor, do you know what the temperature was of the air compressor?

A. No.

Q. And working with the engineer, it was — I believe you said Barbosa was his last name?

A. Barbarosa.

Q. Barbarosa, okay.

Were there any other engineers that you ever worked with during that three-year period?

A. No.

Q. And after you got the gasket out and left it for Mr. Barbarosa to come in and continue the repairs, would you go and do other work on the tugboat?

A. If he didn't need me we would.

Q. And were you responsible for

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ordering any of the gasket material for the air compressors?

A. No.

Q. Were you responsible for going to get the air compressors — I mean get the gasket material for the air compressors out of storage?

A. No.

Q. Do you know where they were stored?

A. In our supply department. But I — yes, I — I know where the supply was, yes.

Q. Okay. But you never had to go get the gasket material?

A. No.

Q. Did you ever see the box or packaging that the new gasket material came in?

A. Yes.

Q. And I think you told us yesterday that you didn't know who the manufacturer of that gasket material was, correct?

A. Yes, I didn't.

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Q. And — because you didn't read any of the manuals or paperwork that came with the new gasket, did you?

A. No.

Q. And you didn't read anything on the box as it related to the new gasket material, did you?

A. No.

Q. Can you tell me when the last time was that you had to remove a head gasket on the Wanamassa?

A. No, I can't.

Q. And I know this wasn't a normal part of your routine and you did it when you were asked to assist by the engineer, but could you estimate how many times during that three-year period that you actually had to remove one of the head gaskets from an air compressor?

A. How many times I had to do it?

Q. Yes.

A. I — that's — that's hard for me to do, you know, to try to give a estimate. I — I — I'd be just guessing.

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Q. Okay. That's fair. I don't want you to guess. I'm just asking if you could give an estimate.

A. No, I can't.

Q. Does your testimony from yesterday still stand that the brakes and the packing were what you did more than anything, as opposed to working with the head gaskets?

DEFENSE COUNSEL: Objection; form.

THE WITNESS: The packing, I only pulled the packing out. I didn't replace the packing.

MR. HEXSTALL: I understand that.

BY MR. HEXSTALL:

Q. But you did that more than you did working with the head gaskets?

A. I don't know if I did it more or not. I know I did both of those jobs. I — I don't know how many times I did each one, so I can't say if I did one more than the other.

Q. Okay. Any idea by looking at the

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gasket material itself, would you be able to tell what the ingredients or the components are merely by looking at it?

A. No.

Q. And you didn't ever have to review any maintenance history or anything with respect to either of these two air compressors, did you?

A. No.

Q. Let me turn your attention now to 1982, when you were at the Philadelphia Naval Shipyard.

A. Yes.

Q. And at that time, you were on the YTM-801 Commodore?

A. Yes.

Q. And I'm going to try to streamline this a little bit. You told us yesterday that you had pretty much the same duties on the Commodore as you did on the Wanamassa?

A. Yes.

Q. So if I asked you all those same questions with respect to what you had to do

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in terms of working with air compressors, would you give me the same answers?

A. Yes.

Q. Do you know — how many air compressors were on the Commodore?

A. I think they had — I think it had two also, because it had the same system. That — this was a

1944 tug. But — but all of it had been remodified to put the shaft brake on and the air whistle.

Q. And the two air compressors on the Commodore, they had the same responsibility in terms of the air horn and the brake?

A. Yes.

Q. Anything else?

A. Not that I know of.

Q. Do you know who the manufacturer was of the two air compressors on the Commodore?

A. They were also Ingersoll Rand.

Q. And what did they look like?

A. The same as the ones that was on the Wanamassa.

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Q. They looked exactly the same, same color?

A. Well, they were — yes, they were all gray. Everything engine-wise in the — a Navy tug or a Navy ship is usually gray.

Q. And in terms of how you knew it was Ingersoll Rand, was it because it was tagged as well?

A. Yes.

Q. Okay. Did you see the words Ingersoll Rand anywhere written on these two air compressors?

A. Same place. They had a tag — tag on it that was — that was — said Ingersoll Rand. And like I said, serial — serial numbers, I don't remember the — I don't know those numbers. And it was written on the — on the top of it also.

Q. And do you know what the temperature was of air in either of these compressors?

A. No.

Q. And when you would have to remove a gasket, it would again be at the request of

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whoever the engineer was?

A. Yes.

Q. Do you recall the name of the engineer at that time?

A. I believe his name was Wehe. But he spelled it —

Q. What's that?

A. — he spelled it W-E-H-E.

Q. That was his last name, correct?

A. I'm sorry?

Q. His last name was W-E-H-E?

A. Yes.

Q. And how many crew members did you have on the Commodore?

A. Eight.

Q. And I think you told us that there was less maintenance that was necessary on these air compressors because there weren't as many ships coming in and out daily, right?

A. Right.

Q. But when you did have to perform some work on the head gaskets, you performed it in the same fashion as you did when it was

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on the Wanamassa?

A. Yes.

Q. And you — they came out the same way; you used the same tools, correct?

A. Yes.

Q. Can you tell me the last time you would have removed a head gasket on an air compressor on the Commodore?

A. No, I can't.

Q. On the Commodore, was there ever a time when you were on leave or on vacation or not working on the tugboat?

A. Sure. I had leave time, yes.

Q. And how long was that?

A. I don't know. It depend — I don't know how much time I was on leave. I took leave different times. Sometimes you take a week; sometimes you take two weeks. I have no idea.

Q. Do you know how many times a year that you might have been on leave —

A. No.

Q. — in one year?

A. No, I don't.

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Q. Well, would it be either one or two weeks at a time?

A. Yes.

Q. And would that be the same with respect to the Wanamassa?

A. Yes.

Q. And the last thing I want to ask you about, just briefly, is the time when you worked for Global Associates at Philadelphia Naval Shipyard.

A. Yes.

Q. That would have been 1991 to '93, correct?

A. Yes.

Q. You were the — the leading foreman. And if I understood your testimony here today, you were removing equipment from inactive ships?

A. Yes.

Q. Do you know the names of any of the ships you worked on during the two-year period?

A. I couldn't recall all the names. I can remember that two of the ships that I

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was on was there also in mothballs, and I know we did remove stuff off of them, off those two.

Q. Do you know the names of those two?

A. The two that I was on, the Voge and the Davis, both were there in mothballs.

Q. Do you recall how many other ships there might have been other than those two?

A. How many ships were in mothball?

Q. Yes.

A. No, I don't know how many. That's — there was a lot of them.

Q. And as I understood your testimony yesterday, you weren't working or repairing any equipment, you were just removing it off the ships, correct?

A. That's right.

Q. And the only way that you believe that you might have been exposed to any asbestos in doing that would have been cutting some of the wire and the insulation on the wire, correct?

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A. Yes.

Q. And there was a number of manufacturers that you looked at in terms of equipment that you were taking off. And do you recall what type of Ingersoll Rand equipment you removed from some of the inactive ships during that two-year period?

A. I don't remember exactly, but it — it probably — it probably was electronic, because it wasn't a whole lot of — I didn't — I didn't pull any – I don't remember pulling any pumps off or any air compressors off.

Q. And in terms of whatever the electronic equipment might have been that was Ingersoll Rand you believe, you didn't have to disturb or repair or maintain that equipment; you just rigged it and took it off, right?

A. Yes.

Q. And what you told me and what I just asked you about in terms of the Wanamassa, when you were at Global Associates during '91 to '93, and when you were on the

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Commodore, that's your only contact you had with any Ingersoll Rand equipment during your career?

A. Well, that's — I'm sure there was Ingersoll Rand equipment on all of the ships that I was on. I didn't have to only — I didn't —

Q. Okay. But I mean —

MR. PRESENT: Please let him finish, Mr. Hexstall. Please let him finish this — you interrupted him right in the middle of a sentence. Let him finish.

MR. HEXSTALL: I'm sorry. I didn't know he was still answering. Go ahead and finish, sir, please.

MR. PRESENT: He was. And he — go ahead. You can finish your answer.

THE WITNESS: There was — I'm sure there was Ingersoll Rand equipment on all of the ships that I was on. So there were times when I would be in the engine room and maybe not in the working

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capacity and being — be in the area where somebody was working on a Ingersoll Rand or some other equipment in the engine room. That was part of the training and — that we did all the time when we were underway. We had to — in order to qualify for surface warfare specialist, you had to know generally about every part of the ship.

BY MR. HEXSTALL:

Q. And I have the list of five ships that you were on during your 20-year Navy career. You — I just want to understand your testimony. You didn't specifically work on any Ingersoll Rand equipment while you were on any of those ships but, you think you may have been in the area when others were working on it, correct?

A. That's correct.

Q. And would you have been supervising them while they were working on any of this equipment or just generally in the area?

A. Just generally in the area for

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training or for an inspection.

Q. And as you sit here today, can you describe specifically what they may have been doing when you were in an area working on any Ingersoll Rand equipment?

A. No, I cannot.

MR. HEXSTALL: Okay. Thank you, sir. That's all the questions I have for you right now.

THE WITNESS: Thank you.

- - -

EXAMINATION

- - -

BY MR. PRESENT:

Q. All right. Mr. McAfee, I do have a few questions about Ingersoll Rand based on some of the questions that Mr. Hexstall asked you. And I will proceed with them now.

I'm going to do them in the same order that — you know, that he did them in. So I'm going to start at the Wanamassa.

First thing, when we're talking about the Wanamassa, he asked you a number of questions about removing gaskets,

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head gaskets from air compressors that were made by Ingersoll Rand.

Do you remember those questions just a few minutes ago that he was asking you?

A. Yeah, he — he asked me —

Q. Scraping —

A. — was I scraping them and to describe them.

Q. That's true. Okay. Well, I have a few other questions about that, those — those experiences and then I'll move on to other issues.

But with respect to the scraping of those gaskets, when it was difficult to get off, when you would have to use a scraper to get them off, what, if anything, would happen to the atmosphere or the air that you were breathing when you would have to scrape those gaskets off the Ingersoll Rand compressors?

A. Well —

MR. HEXSTALL: Objection to form.

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BY MR. PRESENT:

Q. Go ahead. You can answer.

A. Like I — like I told him, you know, if it — if it popped in half — sometimes it would break.

Q. Right.

A. If it would break, you know, it would emit some dust into the area and then I probably would end up breathing it.

Q. Okay. And once again, Mr. McAfee used one of the international signs for the spreading of dust with his fingers.

How long — did you stay in that area when — when you — when the engineer — and I think you said his name was Barbarosa?

A. Yes.

Q. When the engineer, Barbarosa, was — would he be there while you were doing the scraping? Would he be in the same area?

A. Sometimes he would be, or he'd be going to get the new parts or doing something else at the time. Sometimes he would leave us do that. That was a simple job.

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Q. Okay.

A. That wasn't a hard job. So that — those are jobs that we would do, and he would do the technical part.

Q. Did he — was he the one that put the new gasket on?

A. Yes.

Q. Did you witness him doing that? Did you see him doing that?

A. Yes.

Q. Okay. This — I know you couldn't give a number, an exact number, you said you couldn't say an exact number to Mr. Hexstall about —

A. Uh-huh.

Q. — how many times you would remove gaskets and/or scrape gaskets off the Ingersoll Rand equipment, but is there any word that you could use to describe the frequency or lack of frequency that this would happen with? I mean, how often would you be doing that sort of thing on an Ingersoll Rand, if you could just give us — without giving us a number — a general idea,

* * *

* * *

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Q. And how were they powered?

A. By diesel engine.

Q. Do you remember whether or not there was anything on the air compressors?

A. There was — I know there was tags on it. There was a tag on it that said what kind of compressor it was.

Q. Okay. Where was the tag located?

A. At the base, the base of it.

Q. Okay. And what — what did the tag say?

A. Ingersoll Rand, and it had a series of numbers.

Q. Did it say anything else other than Ingersoll Rand?

A. Not that I can recall.

Q. Do you recall any of the model numbers or serial numbers?

A. No, sir.

Q. Other than the tag that said Ingersoll Rand, was there any writing on the air compressor itself?

A. I believe the top of it said Ingersoll Rand too, I believe.

* * *

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do that?

A. No.

Q. Okay. Let me ask you about the head gaskets. Now, I understand this wasn't what your primary responsibility was, but there were occasions where you helped the engineer and removed some head gaskets, correct?

A. Yes.

Q. Did you have to remove anything to get to the head gasket to remove it?

A. Yes.

Q. And what was that?

A. You had to remove the top of the — the top of the — where the gasket was — the gasket was underneath the head, so you had to remove that.

Q. And how did you do that?

A. With a chainfall.

Q. How long did that process take to remove the top to get to the head gasket?

A. I don't remember. You're talking about 20, 30 years ago. I don't remember how much time that was.

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Q. All right. Once you were able to get to the head gasket, you said that you used a scraper to get the gasket up?

A. Yes.

Q. What did the gasket itself look like, the appearance of it once you got the — the top off? What color was it?

A. It was a dark color. I guess I could call it either black or gray, dark gray.

Q. Okay. And did you wear any gloves or anything like that when you were working on the gaskets?

A. No.

Q. Did you have to wear a mask or anything?

A. No.

Q. And the only tool that you used to remove the gasket was a scraper?

A. Yes. If it — if it needed to be. Sometimes some parts of it would come right off; sometimes it wouldn't.

Q. Okay. So sometimes you could just manually pick it up with your hand and

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take it off?

A. Not the whole thing. Some parts of it maybe — maybe would come off with your hand.

Q. Okay.

A. Because —

Q. And if you needed a little more assistance, you would use a scraper?

A. Yes.

Q. And how big was the scraper that we're talking about?

A. It was a little wider than a regular putty knife.

Q. And the majority of the time, did you have to use a scraper or could you just pull it out in pieces with your hands?

A. I wouldn't say the majority of the time I had to use a scraper, but sometimes I did.

Q. Okay. And I thought you testified yesterday that when you pulled this gasket material out, it really wasn't a dusty process, correct?

A. I'm sorry, I didn't understand

Page 244

you.

Q. You told us yesterday that when you pulled the gasket material out, it wasn't really a dusty process, correct?

MR. PRESENT: Objection; misstates testimony.

But go ahead. You can answer.

THE WITNESS: No, I didn't say it was — it wasn't a dusty process. I said it — sometimes it would be if it popped, you know, if it — if it popped, it would produce dust.

BY MR. HEXSTALL:

Q. Okay. So when you were changing a gasket that popped, that's when dust was produced, correct?

A. Yes.

Q. After you got the gasket material out itself, the engineer would come in and put a solvent on and put the new gasket in, right?

A. Yes.

Q. Now, this gasket material, was it hot to the touch at all?

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A. No.

Q. How long would it take you to actually get the gasket out most of the time, if there weren't any problems?

A. Maybe 15, 20 minutes, maybe.

Q. Now, the air compressor, do you know what the temperature was of the air compressor?

A. No.

Q. And working with the engineer, it was — I believe you said Barbosa was his last name?

A. Barbarosa.

Q. Barbarosa, okay.

Were there any other engineers that you ever worked with during that three-year period?

A. No.

Q. And after you got the gasket out and left it for Mr. Barbarosa to come in and continue the repairs, would you go and do other work on the tugboat?

A. If he didn't need me we would.

Q. And were you responsible for

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ordering any of the gasket material for the air compressors?

A. No.

Q. Were you responsible for going to get the air compressors — I mean get the gasket material for the air compressors out of storage?

A. No.

Q. Do you know where they were stored?

A. In our supply department. But I — yes, I — I know where the supply was, yes.

Q. Okay. But you never had to go get the gasket material?

A. No.

Q. Did you ever see the box or packaging that the new gasket material came in?

A. Yes.

Q. And I think you told us yesterday that you didn't know who the manufacturer of that gasket material was, correct?

A. Yes, I didn't.

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Q. And — because you didn't read any of the manuals or paperwork that came with the new gasket, did you?

A. No.

Q. And you didn't read anything on the box as it related to the new gasket material, did you?

A. No.

Q. Can you tell me when the last time was that you had to remove a head gasket on the Wanamassa?

A. No, I can't.

Q. And I know this wasn't a normal part of your routine and you did it when you were asked to assist by the engineer, but could you estimate how many times during that three-year period that you actually had to remove one of the head gaskets from an air compressor?

A. How many times I had to do it?

Q. Yes.

A. I — that's — that's hard for me to do, you know, to try to give a estimate. I — I — I'd just be guessing.

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Q. Okay. That's fair. I don't want you to guess. I'm just asking if you could give an estimate.

A. No, I can't.

Q. Does your testimony from yesterday still stand that the brakes and the packing were what you did more than anything, as opposed to working with the head gaskets?

DEFENSE COUNSEL: Objection; form.

THE WITNESS: The packing, I only pulled the packing out. I didn't replace the packing.

MR. HEXSTALL: I understand that.

BY MR. HEXSTALL:

Q. But you did that more than you did working with the head gaskets?

A. I don't know if I did it more or not. I know I did both of those jobs. I — I don't know how many times I did each one, so I can't say if I did one more than the other.

Q. Okay. Any idea by looking at the

Page 249

gasket material itself, would you be able to tell what the ingredients or the components are merely by looking at it?

A. No.

Q. And you didn't ever have to review any maintenance history or anything with respect to either of these two air compressors, did you?

A. No.

Q. Let me turn your attention now to 1982, when you were at a Philadelphia Naval Shipyard.

A. Yes.

Q. And at that time, you were on the YTM-801 Commodore?

A. Yes.

Q. And I'm going to try to streamline this a little bit. You told us yesterday that you had pretty much the same duties on the Commodore as you did on the Wanamassa?

A. Yes.

Q. So if I asked you all those same questions with respect to what you had to do

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in terms of working with air compressors, would you give me the same answers?

A. Yes.

Q. Do you know — how many air compressors were on the Commodore?

A. I think they had — I think it had two also, because it had the same system. That — this was a 1944 tug. But — but all of it had been remodified to put the shaft brake on and the air whistle.

Q. And the two air compressors on the Commodore, they had the same responsibility in terms of the air horn and the brake?

A. Yes.

Q. Anything else?

A. Not that I know of.

Q. Do you know who the manufacturer was of the two air compressors on the Commodore?

A. They were also Ingersoll Rand.

Q. And what did they look like?

A. The same as the ones that was on the Wanamassa.

* * *

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Q. Okay.

A. That wasn't a hard job. So that — those are jobs that we would do, and he would do the technical part.

Q. Did he — was he the one that put the new gasket on?

A. Yes.

Q. Did you witness him doing that? Did you see him doing that?

A. Yes.

Q. Okay. This — I know you couldn't give me a number, an exact number, you said you couldn't say an exact number to Mr. Hexstall about —

A. Uh huh.

Q. — how many times you would remove gaskets and/or scrape gaskets off the Ingersoll Rand equipment, but is there any word that you could use to describe the frequency or lack of frequency that this would happen with? I mean, how often would you be doing that sort of thing on an Ingersoll Rand, if you could just give us — without giving us a number — a general idea,

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using an adjective?

A. On the Wanamassa?

Q. On the Wanamassa.

A. Many.

Q. Okay. And would — would your experience with the dust and the breathing when you would have to scrape it be the same? Would it be the same each time you did it?

A. Yes.

Q. The —the replacement part that —that —that he went and got, when he —when he brought the replacement gasket to the Ingersoll Rand compressor to install, did you get a look at that? Did you get a look at either the packaging or the actual gasket before he would put it on?

A. Yes.

MR. HEXSTALL: Objection; asked and answered.

BY MR. PRESENT:

Q. Is there anything that you can tell me about, you know, who supplied that gasket, what — what company, if you know? Did you ever notice that at any of the times

* * *

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were on the compressor. Do you remember giving that testimony to Mr. — to Mr. Hexstall?

A. Yes.

MR. HEXSTALL: Objection; misstates testimony. He said he knew that that was done, but he wasn't there watching it.

MR. PRESENT: Okay. Well, just because you'd like that to be the testimony doesn't mean it's the case, Mr. Hexstall.

BY MR. PRESENT:

Q. Did you actually witness that happening from time to time?

A. Yes.

Q. When — when the engineer would remove the packing from the valve that was on the Ingersoll Rand compressor, what if anything would happen to the air that was in the vicinity of this activity? Can you describe that for me, when he would remove the packing?

A. (No response.)

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Q. Would it — would it cause a difference in the air?

A. If it came out in pieces, yes.

Q. Okay.

A. The old — the old packing you're talking about?

Q. Yes, the old packing.

A. Yes. Yes.

Q. What would you see? What would you see happen when he would remove the old packing?

A. You'd see little strings pop into the air, little — little dust like that would pop.

Q. Okay. Stringy dust? Is that what you're calling it?

A. Yes. Yes.

Q. And when that dust was in the air, would that have any effect on you?

A. I imagine I would breathe it.

Q. Okay.

A. Yes.

Q. Well, do you remember being in the vicinity of that dust when that would

* * *

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A. No.

Q. Did you ever see any kind of warning on any of the gaskets themselves or their packaging saying that if you breathed in dust from that material you could get lung cancer from it?

A. No.

MR. HEXSTALL: Objection.

BY MR. PRESENT:

Q. With respect to the actual Ingersoll Rand compressors, the equipment that you were working on on the Wanamassa, did you ever see any kind of warning or placard on that equipment warning you that your safety was in jeopardy and you needed to take precautions so that you wouldn't get sick from breathing in that dust? Did you ever see anything like that?

A. No.

MR. HEXSTALL: Object to form.

BY MR. PRESENT:

Q. And if I asked you — and I'm going to — I'm going to be as much of a streamliner as Mr. Hexstall. If I were to

* * *

* * *

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Q. Okay.

A. No.

Q. Did the — the Wanamassa, I guess being a tugboat, did it also have a horn?

A. Yes.

Q. And — and what was it that ran the horn on the Wanamassa?

A. A compressor.

Q. Okay. And did you do work on that compressor?

A. Yes.

Q. Okay. And do you remember who made those compressors?

A. Ingersoll Rand.

Q. Okay. And what kind of work would you do on the compressor?

A. We would assist the engineer. You know, like if we had to rig anything off, we'd rig it off. Send people to go get things for him. It depend on what he was taking off of it. If he was repacking something, you know, we — we may have to — he ask us to take the old packing out while he prepares to put the new in.

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Q. When you would take the old packing out of the Ingersoll Rand compressor, can you tell the jury what, if anything, would happen to the air or the atmosphere when you would do that?

MR. HEXSTALL: Objection; leading; form.

THE WITNESS: Well, the — the old — the old stuff usually was dried out. And it shredded, you know, and it — it would — particles of it would — would — would go into the air and stuff.

BY MR. PRESENT:

Q. And when those particles from the packing on the Ingersoll Rand compressor went into the air, how would that affect you?

A. We — we'd end up breathing it.

Q. Was there any kind of warning, either on the packing or the compressor telling you that breathing in those particles could give you lung cancer?

MR. HEXSTALL: Objection; form.

THE WITNESS: No.

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BY MR. PRESENT:

Q. And how frequently would you say — how long were you on the Wanamassa? I'm sorry.

A. Let's see, I went — '77 to '80.

Q. And during that time, how often would you say you were pulling packing or assisting other people from pulling packing off Ingersoll Rand compressors?

A. I can't pin down a number of times. I just know we were always doing something in the engine room, either packing or gaskets or pulling heads off or something down there.

Q. Okay. But —

MR. HEXSTALL: Move to strike; nonresponsive.

BY MR. PRESENT:

Q. With — with respect to the — the compressors, though can you just give me a general idea over the three years how often you would be pulling packing off an Ingersoll Rand compressor? Was it, you know, once a week, once a month? Would it depend on the

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circumstances? How was it?

MR. HEXSTALL: Objection; leading; form.

THE WITNESS: It was many times. It was many times we did it, you know.

MR. PRESENT: Okay.

THE WITNESS: It had two compressors.

BY MR. PRESENT:

Q. And — and would your experience with those particles be the same each time you did that on the two Ingersoll Rand compressors?

MR. HEXSTALL: Objection; leading.

THE WITNESS: Yes.

BY MR. PRESENT:

Q. And would you — would the effect on your breathing be the same each and every time that happened?

MR. HEXSTALL: Objection; leading.

THE WITNESS: Yes.

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BY MR. PRESENT:

Q. I know we've talked about this before, but can you tell the members of the jury that — with respect to any of the packing that you did use, do you recall the name of the packing that you used back there on the Wanamassa?

A. I know — I know the — the ones for the — for the valves.

Q. And — and what was the name of those packings?

A. John Crane.

Q. Okay. One other question I want to ask you about the compressors, before I move to John Crane. Was there anything that you read in any kind of books or anything, you know, associated with the compressor or the packing that told you that the packing that you were pulling off was asbestos?

MR. HEXSTALL: Objection; leading.

THE WITNESS: Yes. The —

BY MR. PRESENT:

Q. Okay. And what was that?

* * *

Robson Forensic

Engineers, Architects, Scientists & Fire Investigators

ARTHUR W. FAHERTY

Marine Engineer and Mechanical Expert

Experienced in the installation, testing, start-up, safe operation, maintenance, modification, troubleshooting, upgrade and repair of marine and industrial machinery, equipment and systems.

Manufacturing Processes: General machining, welding, brazing, grinding soldering, oxyacetylene cutting, aligning, shrink fitting, liquid and dry filling, dry solids handling, slurry handling, liquid handling paint preparation, painting, hot tapping.

Manufacturing Procedures, Standards, and Specifications: Pressure vessels, power piping, high-pressure air compressors, low-pressure air compressors, pipe welding, structural welding, drawing standards, hazardous area requirements, electrical generation and switchboards.

Test Methods and Specifications: Hydrostatic testing, vibration testing, static and high speed dynamic balancing, material specifications.

Engineered Systems: Steam; condensate-steam and motor plants; condensate-landfill; feedwater; liquid fuel; natural gas; methane collection; potable water; refrigeration; salt water service; ballast; tanker cargo; fire protection; waste water; hydraulic power; pneumatic power; pneumatic controls heating; ventilation and air conditioning; bag houses; sludge;

oily water; sewage; cleaning and repair of tank farm pipelines, tanks and pumps.

Machinery: Diesel engines, fuel injection equipment, high speed centrifuges, compressors, heat exchangers, refrigeration compressors, absorption and centrifugal chillers, liquid and gas fired boilers, cooling towers, air handlers, valves and fittings, turbines, turbochargers, jib cranes, monorail cranes and hoists, winches and capstans, cargo machinery, bridge cranes, industrial scales, milling machines, lathes, presses, screw conveyors, belt conveyors, roller conveyors, drive gears, clutches, distillers, reverse osmosis, spreader beams, lifting and rigging gear, horse drawn machinery, farm tractors, vactors and industrial vacuums, elevators (passenger and freight), fuel oil blending, steering gears, hydraulic rams, rotating machinery, pumps (centrifugal, reciprocating, progressive cavity, positive displacement, screw, pneumatic).

Machinery Safeguarding: Safety interlocks, failsafe modes, caution and warning signs, machine guards, drive guards, instruction manuals, controls, damage control and damage control methods.

Safety Procedures and Requirements: Material Safety Data Sheets, right-to-know, confined space entry, lockout/tagout, scaffolding, training policies, inspections, OSHA requirements, industrial cranes – shipboard, shoreside, shipyard.

Tools: Drill press, lathes, milling machines, table and radial arm saws, rotary pneumatic drills, impact wrenches, nail guns, high pressure water blasters, high pressure washers, hand tools.

Wharfinger: Duties and responsibilities.

Products: Bicycles, motorboats – gas and diesel, Alpine and Telemark skis, rope tows.

Regulatory Compliance: American Bureau of Shipping, DnV, IACS, IMO, ISM, Marpol, U.S.C.G., OSHA.

Specialized: Graving docks, floating drydocks, marine railways, shipboard automation, shipyard contracts, assessment of marine operations, U.S.C.G. License Chief Engineer Unlimited Horsepower – Motor, Third Assistant Engineer-Steam, stability/inclining experiments, marine bulkheads.

PROFESSIONAL EXPERIENCE

2006 to present	**Robson Forensic, Inc.**	
	Area Manager for Seattle Area	2009-present
	Area Manager for Upstate/Eastern New York and Vermont	2006-2009
	Provide technical investigations, analysis, reports, and testimony towards the resolution of commercial litigation cases and personal injury cases involving commercial vessels and pleasure craft.	
1996 to present	**Arthur Faherty**	
	Consultant, Port Engineer	
	Work includes direct involvement with nuclear industry for safe operation of standby generators for shaft alignment, vibration problems and root cause	

analysis; troubleshooting large centrifugal machines for environmental clean-up in South America and purifier operations. Design work with naval architecture firm including work on installing additional engine on dynamic positioning drill vessel. All phases of shipboard operations– machinery, cargo, regulatory, human resources. Worked with German Engineering firm to market digesters for animal waste to farmers in western United States. Instructed Pipeline Hydraulics for COTCO (Cameroon Oil Transportation Company, a division of ExxonMobil), Pipeline Operators, Field Supervisors, and Pipeline Engineers for 1100 KM pipeline for pumps, pumping, hydraulic surges, system operation, testing and maintenance (Douala, Cameroon; September 2013).

1988 to 2006 **U.S. Merchant Marine Academy, Global Maritime and Transportation School**

Visiting Professor

Areas of expertise and instruction include vibration training for nuclear power plants, shipboard propulsion systems (steam and diesel), rotating machinery (reciprocating and centrifugal pumps, centrifugal and reciprocating air compressors, centrifugal and reciprocating AC compressors, purifiers), piping systems, refrigeration, including ammonia, HVAC systems, low pressure and high pressure boiler control systems, waste treatment systems, evaporators and reverse osmosis units, Marpol regulations, Classification Society rules and regulations, electrical distribution and switchboards systems (480 and 5kV), shipboard management, shipyards, shipboard automation systems and simulation training.

Programs include Ship of the Future for the U.S. Navy, MARAD Inspectors, ABS Surveyors, Diesel Engine Training for Exxon, Military Sealift Command, ARCO, License Upgrade, Diesel Generator performance for public utilities, U.S. Army Reserve Training for vessel operations, shipyard course for U.S. Navy reserve units, National Sealift Training for Engineers (both for Superintendent Engineers and for operating personnel) for hull surveys, engine room surveys and breaking out the plants and QMED program for MSC. Courses are developed using the IMO model for classroom instruction. Co-authored assessment of Staten Island Ferry System resulting in reorganization of system to reflect shipboard safety and operating standards.

2004 to 2005 **M.V. Cape Horn, Marad ROS RO/RO, 22,000 BHP**

Chief Engineer

Responsible for main propulsion engine, diesel generators, all rotating machinery including pumps, air compressors, purifiers, reciprocating AC and refrigeration compressors and all hydraulics for ramps, car decks and winches, 40 ton electro-hydraulic crane, sewage treatment plant, evaporators, interior communications and electrical switchboard and distribution. Refurbished Bridge Control system and put it in use for the first time in more than 6 years.

1998 to 1999 **Cresmont Technical Services**

Program Manager

Program Manager to design, build and operate a 3 megawatt methane-to-energy plant in Puyallup, Washington. Consultant to develop a West Coast facility for NAVSEA and MARAD vessel scrapping. Project Manager for tugboat acquisition and vessel conversion program to convert vessels into hospital ships. Consultant to bunker suppliers for fuel problems encountered on board.

1996 to 1998 **CBS Engineering, Inc.**

Senior Consulting Engineer

Construction of barges, marine issues, plant operations and plant review. Oversaw construction and delivery of $3.8M barge (400'X 100') for production platform. Responsible for operational review of 80 megawatt gas turbine power plant, centrifuge operations and mooring of barges to API specifications. Performed analysis for FPSO operations and cost for conversions in shipyards around the world.

1994 to 1996 **Wehran Energy**

Plant Manager

Ran all aspects of 2.5 megawatt methane gas to energy plant including investment to upgrade and plant expansion to 5 megawatts. Operation consisted of field expansion, field maintenance, compressing gas, flaring, condensate separation, electrical generation, pollution control and interfacing with town, county, and utility officials for upgrade and expansion.

1992 to 1994 **Fore River Shipyard & Iron Works, Inc.**

Owner

Shipyard repair and steel fabrication business. Drydocked vessels from barges to 860' SeaBee class LASH vessel. Experienced in blasting and painting of hulls and tanks, engine work, piping renewal, steel replacement, superstructure work, welding, brazing, oxyacetylene cutting and welding, machining (lathes, milling machines). Workforce of up to 128 people. Also accomplished steelwork for bridge sections and construction of barges for public authority. Accomplished design work for steam driven power barges for international power plant developer for use in South America and in the Middle East. Solved issues on delivering these plants to the various areas; this included surveying various rivers in Colombia for future installations.

1988 to 1992 **AK Engineering, Inc.**

Founder, Stockholder and Vice President

Company specialized in marine and industrial engineering projects. Responsibilities included overhaul of 6 X 6.1 Megawatt diesel generators, large oil/water separation project for utilities, ultra-high water pressure technologies for utilities and U.S. Post Office (cutting into a building in NY city while mail was being processed for expansion), very fast track construction of co-generation plant (gas driven engines with absorption and centrifugal chillers, boilers, pumps and cooling towers all controlled by pneumatic controllers). Vessel activation and deactivation for Operation Desert Storm (13 vessels).

1983 to 1988 **Various U.S. Shipping Companies**

Consultant and Chief Engineer/Fleet Engineer

Chief Engineer for three re-flaggings – two vessels were from Swedish flag to U.S. flag and one vessel was from Liberian flag to U.S. flag. Installed generator control systems to make generators fully automated. Surveyed vessels for owners to meet various RFP's with regard to budget and operational characteristics. Supervised the dry-docking of ships, accomplished troubleshooting of automation on board and provided corrective procedures, taught crews how to perform under limited manning schedules. Assumed Chief Engineer duties on poorly running vessels and returned vessels to maintenance status and in class while maintaining low overtime. Vessels included dry cargo, RO/RO, car carrier and tanker. Experienced in all types of diesel engines, generators, cranes-monorail, jib, electro-hydraulic, overhead; galley equipment including dishwashers, fryers, potato peelers, potato mashers, ovens and ventilation systems for the galleys, elevators for both people and cargo, winches, anchor handling and heat exchangers. Also experienced with impact wrenches, Sweeney wrenches, hydraulic stretching for cylinder and bearing bolts.

1978 to 1983 **Pacific Gulf Marine**

Chief Engineer on Motor Vessels

Several shipyard periods and class surveys accomplished. Vessel always remained on charter.

1971 to 1983 **Various Shipping Companies**

Various Engineering Capacities from Third Engineer to Chief Engineer

Worked on German, Japanese and American vessels. Built ships in two U.S. yards and in one Japanese yard for various owners. Officer in Charge of Ammonia Refrigeration System (2 years).

1983 **Reflag of M/V American Eagle**

Chief Engineer

Responsible for the paperwork and physical work to convert the vessel from Swedish flag to American Flag including engine room and structural steel including fabricating and welding on the aft car decks.

1978 to 1983 **Pacific Gulf Marine**

Chief Engineer on Motor Vessels

Several shipyard periods and class surveys accomplished. Vessel always remained on charter.

1976 to 1978 **Zapata Bulk Transport 4 x 40,000 Product Tanker**

Machinery Inspector/Hull Inspector/Cargo Inspector

Responsible for signing off all machinery and piping in Engine room, cargo systems including pumproom and environmental trough for Class as well as machinery, cargo systems, pump room and controls for Zapata Courier.

1974 to 1975 **New Construction, Tsuneishi, Japan for Sanko Lines, 80,000 dwt Crude Oil Tanker**

2nd Engineer

Responsible for signing off fueling stations, cargo piping and environmental trays, HFO Purifiers and main engine

1973 **New Construction of M/V Sugar Islander**

3rd Engineer

Responsible at yard for sign-off on fueling stations including environmental wells, purifiers, boiler, and evaporator at Lockheed Shipbuilding, Seattle.

PROFESSIONAL CREDENTIALS

Chief Engineer, Unlimited Horsepower-Motor Third Assistant Engineer Unlimited-Steam 8th Issue, Current through April 2010

EDUCATION

B.S., Marine Engineering, United States Merchant Marine Academy, Kings Point , NY

Additional Continuing Education: Achieving Safe Permit-Required Confined Space Entries, Prospering Safely (Fred Straub), October 2013 Current Issues in Maritime Law, WSBA, October 2011 Maritime Personal Injury CLE (Lorman), Seattle, WA, July 2011

Sulzer Brothers Diesel Program, Winterthur, Switzerland

CERTIFICATIONS

Standards Certification, American Boat and Yacht Council Certified Universal Refrigeration Certification

PRESENTATIONS

CO Poisoning: Silent, Deadly and with Us All the Time (Lessons Learned from Litigation), Western Trial Lawyers Association Convention, Maui, HI, June 13, 2013

Arthur W. Faherty being duly sworn upon his oath deposes and says:

1. I have been employed for many years in the fields of U.S. Navy equipment, and in the applications of U.S. Navy requirements under military specifications, usually referred to as mil specs and the issuances of the Secretary of the Navy and his designees and assignee and subordinates.

2. I am familiar with U.S. Navy's rating of E2 and Boatswain Mate (BM) and the work areas and functions of each rating.

3. A copy of my CV is attached hereto and incorporated herein by reference as Exhibit A.

4. I am aware of the Navy specifications for equipment for World War II era ships.

5. I have considerable experience in the interpretation of military and Navy documents.

6. I am aware of the Navy specification for the equipment for World War II era ships and later, known as general specification for Machinery Sub S1-1 page 2.

7. These specifications required warnings and safety precautions.

8. The 1936 specifications required taking of precautions and warnings.

9. I am familiar with MIL-M-15071D, which was the military specification and its predecessors including 15071A-C and the specifications referenced in paragraph 5 of that document. MIL-M-15071A-D are roughly the same and involve similar requirements.

10. 15071 states that the intent of the Navy was to accept the usual commercial manuals when roughly equivalent to the overall requirements of Navy.

11. Mil Spec 15071-D was later succeeded by MIL-15071E.

12. 15071D requires submission of the manual to the Bureau of Ships which would then adopt the manual as a Navy document.

13. 15071D requires manuals to contain safety precautions (Section 3.1.9).

14. 15071D requires that all manuals must contain notes, cautions and warnings to emphasize critical instructions. (Section 3.3.6).

15. Included was the definition of the term "warning" which is defined by the Navy as operating procedures and practices which will result in personal injury or loss of life if not correctly followed. (Section 3.3.6 (c))

16. 15071D Section 3.1.7 requires instructions to include precautions.

17. I am acquainted with the deposition testimony concerning the Plaintiff's exposure to asbestos while in the Navy, post Navy working at the Philadelphia Naval Shipyard for Global and, while not my area of expertise, while working for the US Post Office in Glassboro, New Jersey.

18. Plaintiff served on 7 Navy vessels, the USS Voge (delivered in 1963), the USS Davis, (delivered in 1955), the USS Yosemite (delivered 1942), the tug Wanamassa (delivered 1973), the USS Butte (delivered 1967) ,the tug Commodore and the USS Nitro (commissioned 1959).

19. While Plaintiff served on Voge he used Guard gloves during training for fire-fighting duties as well as for use in the gun mount, to pull spent casings. Plaintiff testified that the Guard gloves contained asbestos.

20. Plaintiff testified that as a maintainer/cleaner onboard the Voge he was exposed to asbestos dust that shook loose after the guns and/or ASROCs were fired and during the cleaning of the accumulated dust.

21. Plaintiff testified that he was exposed to asbestos on the Davis from the insulation dust that came loose when firing the guns onboard and from use of Guard Gloves, used in damage control/fire-fighting drills.

22. While on board the Yosemite, Plaintiff testified that there were two potential exposures to asbestos:

a. Once when rigging the chain fall rubbed through steam piping, taking the insulation off over their heads and dropping dust down, and

b. When removing and re-installing tiles from the mess deck where they had to scrape to remove the old tiles, creating a lot of dust.

23. On the Wanamassa, Plaintiff testified that all hands would help the engineer do repairs in the engine room on the shaft air brakes, on air compressors and on the various pumps. Plaintiff testified that due to the service hours as a harbor tug in Guantanamo Bay, there was a high amount of maintenance needed to keep the tug operational.

24. On the Commodore, the service hours were a lot less, but the work was similar.

25. Plaintiff testified that there were no warnings about the dust in any of the above cases.

26. After retiring from the Navy, Plaintiff went to work for Global Associates at the Philadelphia Naval Shipyard. Global had a contract to remove specified parts from laid-up ships that could be used on active vessels. The work involved cutting wires, freeing the equipment and rigging the equipment off the inactive vessel. Items removed included equipment made by Westinghouse, Ingersoll Rand and General Electric. Plaintiff testified that some wires were made by Westinghouse.

27. After working at Global Associates, Plaintiff testified that he worked at the US Post Office, first in Wenonah, New Jersey and then on Glassboro. In Glassboro, the janitor repeatedly buffed the floor, causing dust. When tested the results were asbestos and the flooring had to be removed.

28. I am also familiar with Department of Navy Sec Nav 62603.5 later Sec. NAV 5700.5 dates 1956.

29. This document is also known as Uniform Labeling Program for Hazardous Industrial Chemicals and Materials, hereafter Uniform Labeling Program and was in place when the Plaintiff entered the Navy.

30. The Uniform Labeling Program was designed to standardize labeling requirements for hazardous products and provide labels to contain pertinent information to warn users of potential dangers.

31. The Uniform Labeling Program applied to Labeling of all hazardous materials throughout the Navy.

32. The Uniform Labeling Program was not designed to govern the type of warning labels.

33. The Navy stated that the type of labels were to be governed by state and federal laws and regulations.

34. The Uniform Labeling Program noted that development of new products makes it mandatory that precautions should be taken including warning labels. (Section 3)

35. For poisons, a skull and cross bones was to be affixed.

36. Poison is defined as a substance with an inherent property that tends to destroy life or impair health. Asbestos is essentially a poison.

37. Paragraph 1.C of enclosure (3) defines a Class III toxic hazard as any industrial or military material which may be given off a harmful, vapor, dust, fume or mist during handling or operation. The injuries effect may arise from one exposure (acute) or repeated exposures over a prolonged period (chronic). The made of entry into the body may be by ingestion, inhalation or absorption through the skins.

38. Paragraph 2.a of the Uniform Labeling Program refers to the Warning Labeling Guide published by the Manufacturing Chemists Association.

39. This Guide, first published in 1946, requires precautionary labels for harmful dust. The reference to the guide shows the Navy's constant concern for warnings of hazards like asbestos.

40. The only conclusion that can be drawn is that espoused by Captains Lowell and Moore whose affidavits and essential conclusions I agree with based

on my many years of experience with the Navy and ships. These are attached as Exhibit D and E.

41. This conclusion is that by the time Plaintiff began his Navy service on the Voge the Navy required warnings of the hazards of asbestos in equipment for ships and that all claims that the Navy would have barred or prevented warning labels are untrue.

42. It is clear from these documents that the Navy wanted the warnings to reach Navy personal such as Plaintiff.

43. The Navy required manufacturers not only to warn on the products but to supply manuals containing warnings to each ship and precautions for use of the product.

44. Thus, when defendants sold products for use on ships that lacked warnings that met state and federal standards and/or the standards of the Manufacturing Chemists or the American Conference of Government and Industrial Hygienists this was in violation of specific Navy directions and requirements.

45. Rather than barring warnings, the Navy encouraged warnings, and the failure to warn of the hazards of asbestos violates Navy requirements.

46. The failure to include warnings and safety precautions in their manuals of their equipment violates specific Navy requirements.

47. The claim that the Navy would have barred warnings is thus false and without basis.

48. Some of the defense experts suggest that because the Navy manuals contain no warnings the Navy believed asbestos to be safe.

49. The fact that there is no discussion of asbestos hazards in Navy documents suggest the Navy did not know of asbestos hazards.

50. Asbestos was generally required on all high heat applications.

51. In many cases the suppliers of such equipment usually supplied asbestos product with/on/in their equipment.

52. Suppliers of equipment to the Navy were engaged by the Navy to participate in renovation and overhaul of their own equipment, or that of others, including asbestos containing parts in shipyard repairs.

53. Suppliers of equipment frequently supplied replacement asbestos or disturbed previously supplied asbestos as part of their activities on ships.

54. I expect to testify, at trial, on what the Navy archive records show about equipment supplied to the vessel, or vessels at issue and what the records show as individual defendants supplying original or replacement asbestos containing equipment or disturbing asbestos.

55. Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendants was entirely removed.

56. The removal of the entire initial asbestos never occurred.

57. I cannot comment, in this affidavit, as to defendants whose material I have not yet examined, but will supplement my testimony at trial by reliance on the documents from the archives.

58. I am also prepared to discuss the use of asbestos on Navy ships.

Sworn to and subscribed Before me this 28th day of May, 2014	[Notary Stamp]	s/ Arthur Faherty Arthur Faherty

s/ Mollee M. Grossman
NOTARY PUBLIC

STATE OF INDIANA	)	**IN THE MARION SUPERIOR COURT CIVIL DIVISION, ROOM TWO**
COUNTY OF MARION	)	**CAUSE NO. 49D02-9501-MI-0001**
	)	
IN RE: MARION COUNTY ASBESTOS LITIGATION	)	This document relates to all cases in the S-2 Master File

INTERSOLL-RAND COMPANY'S AMENDED ANSWERS TO PLAINTIFF'S MASTER INTERROGATORIES AND RESPONSE TO PLAINTIFF'S MASTER REQUEST FOR PRODUCTION TO DEFENDANT MANUFACTURERS/DISTRIBUTORS

INGERSOLL-RAND COMPANY, by and through its attorneys, GUNTY & McCARTHY, hereby submits the Answers and Responses aforesaid and in support thereof states as follows:

PRELIMINARY STATEMENT AND OBJECTIONS

(a) The information supplied in these Responses is not based solely upon the knowledge of the executing party, but includes some information assembled by and/or within the knowledge of the party's authorized agents, representatives, and unless privileged, attorneys. Because much of the information is of, or relates to, events of many years ago, it is impossible for this Defendant to retrieve or reconstruct some of the requested information. Many of the individuals who might have had personal knowledge of the matters to which Plaintiffs' discovery relate are deceased or are otherwise unavailable to Defendant, and investigations to date indicated that some information in documents which might relate to matters inquired into by Plaintiffs' discovery may have been destroyed pursuant to the Ingersoll-Rand Company's record retention policy or are otherwise unable to be found. This Defendant is engaged in a continuing investigation with respect to the matters inquired into by Plaintiffs' discovery. Therefore, this Defendant reserves the right to amend these responses if new or more accurate information becomes available or if errors are discovered. Furthermore, these responses are given without prejudice to this Defendant's right to rely at trial on subsequently discovered information inadvertently omitted from these responses as a result of mistake, error or oversight.

* * *

C. The date when such activity was terminated;

D. If such activity was terminated, the reason why;

E. Within the United States was there any geographic limitation which you claim was applicable to the sales of your asbestos containing products or component parts of any asbestos containing products (Yes or No)?

If Yes state the geographical area into which you claim your asbestos containing products or component parts were sold; and

F. Identify the organizational unit of Defendant so engaged.

ANSWER: Defendant submits that to the best of its knowledge none of its corporations, companies, businesses or joint ventures, have ever mined, milled, or manufactured "asbestos products" or "asbestos containing products" as it believes these terms are defined. For over one hundred and twenty-five years Defendant has manufactured numerous types of multi-use products, including pumps, compressors, and turbo machinery that may have contained components manufactured by third parties. Some of these components and its replacement parts may have had internal part(s) consisting of gasket(s), seal packing(s), and/or brake components manufactured by these third parties that contained encapsulated asbestos fibers. Regarding these purchased internal encapsulated asbestos containing parts that may have been incorporated into its equipment, Defendant purchased them from various manufacturers based upon commercial availability and the particular application involved. Upon information and belief, some of these part manufacturers may have included Garlock, Flexitalic, Crane and/or Anchor Packing. Defendant does not maintain a list of the equipment, which may have incorporated a purchased internal encapsulated asbestos part. The asbestos content, fiber type and composition of such a part would be only within the knowledge of that part(s) manufacturer. However, as it is generally known in the industry, Defendant believes these types of asbestos-containing parts contained only chrysotile asbestos fibers. The first date any purchased internal encapsulated asbestos containing component part was utilized by

Defendant in its products in the United States is unknown. Defendant estimates that these parts were no longer utilized when viable alternative non-asbestos containing parts became commercially available from the third party manufacturers to Defendant. See also Preliminary Statement (f).

Defendant's records are not maintained in a manner that if given a specific site Defendant can state whether products with an purchased internal encapsulated asbestos containing part(s) was sold to that location. Ingersoll-Rand does not maintain its records in a manner to respond to a particular method used in the sale of its goods. Pursuant to the corporate document retention policy sales

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STATE OF PENNSYLVANIA §

COUNTY OF PHILADELPHIA §

AFFIDAVIT OF ARTHUR L. FRANK, MD, PhD.

I am a Physician and Professor of Public Health at Drexel University where I hold the position of Chair of Environmental & Occupational Health. I am also a Professor of Medicine at the Drexel University College of Medicine. I am a Board Certified medical doctor, having received my medical degree in 1972, from the Mt. Sinai School of Medicine. I have been Board Certified by the National Board of Medical Examiners since 1973; have been a Diplomat of the American Board of Internal Medicine since 1978 and with the American Board of Preventive Medicine (Occupational Medicine) since 1979. I received my Ph.D. in 1977 from the City University of New York, where I studied in its Biomedical Sciences Doctoral Program. I have performed cancer research at the National Cancer Institute, participated in epidemiologic studies of asbestos-exposed populations, taught asbestos medicine and public health to medical students and doctors, and have devoted my professional life to the study and prevention of asbestos-related disease. I have published numerous peer-reviewed papers, book chapters and presentations on the topic of the causes and prevention of asbestos-related disease. The opinions herein are based on my own work, experiences, publications and those cited. My current CV is attached hereto. I have provided expert opinion in numerous jurisdictions, mostly for plaintiffs, on the causation between asbestos exposure and the development of mesothelioma and other asbestos-related diseases.

I hold the following opinions to a reasonable degree of medical and scientific certainty:

Outside of Court, the Mainstream Scientific Consensus, Based on a Weight-of-the-Evidence Approach, is that All Forms of Asbestos Can Cause of All of the Asbestos-Related Diseases

1. There is overwhelming, generally accepted evidence that inhalation of asbestos fibers of any type, from any source or product, causes mesothelioma (in all known locations), lung cancer, asbestosis, pleural plaques, and other cancers. I joined fifty-one (51) scientists in expressing my opinions about the hazards of asbestos in the article by Welch et al,[1] entitled

[1] *Welch et al., Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme*

Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme Court. I continue to hold the opinions set forth in that published paper, along with the other opinions expressed here, to a reasonable degree of medical and scientific certainty.

Outside the courtroom, there is little or no dispute in the medical literature that all asbestos fiber types, including chrysotile, cause asbestosis, lung cancer, and pleural plaques/thickening. The methodology and bases for the opinions as stated herein are not novel and for the reasons set forth are generally accepted in the medical and scientific community.

2. There are numerous occupational epidemiology, registry and case studies clearly linking all types of asbestos, including chrysotile asbestos, to pleural and peritoneal mesothelioma.[2]

Court. Int J. Occup. Environ. Health. 13:318+327 (2007) (a copy is attached hereto). This peer reviewed paper, while presented to a court, is a reliable review of the medical and scientific literature. Welch et al. (2007) presents the peer reviewed scientific position of the signatories and is a scientific – rather than legal – review of the mainstream approach to causation of asbestos disease.

[2] Kanarek, *Mesothelioma from Chrysotile Asbestos: Update*. AEP Vol. 21, No. 9, pp. 688–97 (2011); Hein et al, *Follow-up study of chrysotile textile workers: Cohort mortality and exposure-response*. Occup. Environ. Med. 64:616–625 (2007); Loomis et al., *Lung cancer mortality and fiber exposures among North Carolina asbestos textile workers*. Occup. Environ. Med. 66:535–542 (2009); Silverstein et al., *Developments in asbestos cancer risk assessment*. Am. J. Ind. Med. 52:850–858 (2009); Finkelstein et

3. "There is general agreement among scientists and health agencies. . .[e]xposure to any asbestos type (i.e., serpentine [chrysotile] or amphibole) can increase the likelihood of lung cancer, mesothelioma, and nonmalignant lung

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al., *Mesothelioma among employees of a Connecticut factory that manufactured friction materials using chrysotile asbestos*. Ann. Occup. Hyg. 54:692–696 (2010); Egilman et al., *A case of occupational peritoneal mesothelioma from exposure to tremolite-free chrysotile in Quebec, Canada: A black swan case*. Am. J. Ind. Med. 54:153-156 (2011); Pira et al., *Mortality from cancer and other causes in the Balangero cohort of chrysotile asbestos miners*. Occup. Environ. Med. 66:805–809 (2009); Mirabelli et al. *Excess of mesotheliomas after exposure to chrysotile in Balangero, Italy*. Occup. Environ. Med. 65:815–819 (2008); Turci et al., *Role of associated mineral fibres in chrysotile asbestos health effects: The case of Balangeroite*. Ann. Occup. Hyg.; 53:491–497 (2009); Everatt et al., *Occupational asbestos exposure among respiratory cancer patients in Lithuania*. Am. J. Ind. Med. 50:455–463 (2007); Madkour et al., *Environmental exposure to asbestos-response relationship with mesothelioma*. Eastern Mediterranean Health J. 15:25–38 (2009); Yano et al., *Mesothelioma in a worker who spun chrysotile asbestos at home during childhood*. Am. J. Ind. Med.;52:282–287 (2009); Baumann et al., *Pleural mesothelioma in New Caledonia: An acute environmental concern*. Cancer Detect Prev. 31:70–76 (2007); Baumann et al., *Pleural mesothelioma in New Caledonia: Associations with environmental risk factors*. Environ. Health Perspect. 119:695–700 (2011); Nishikawa et al., *Recent mortality from mesothelioma, historical patterns of asbestos use, and adoption of bans: A global assessment*. Environ. Health Perspect. 116:1675–1680 (2008); Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases*. Annual Rev. Public Health, 34: 4.1 – 4.12 (2013); Wang et al., *Cause-Specific Mortality in a Chinese Chrysotile Textile Worker Cohort*. J. Japanese Cancer Ass'n (2012).

and pleural disorder."[3] Many other reviews support this conclusion, such as those from the American Conference of Governmental Industrial Hygienists,[4] the American Thoracic Society,[5] the Environmental Protection Agency,[6] the International Agency for Research on Cancer (IARC),[7] the National Toxicology Program,[8] the Occupational Safety and Health Administration,[9] the Consumer Products Safety

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[3] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological profile for asbestos. Atlanta: Agency for Toxic Substances and Disease Registry; (2001).

[4] American Conference of Governmental Industrial Hygienists. Asbestos: TLV® Chemical Substances 7th Edition Cincinnati OH: ACGIH; Report No.: Publication #7DOC-040 (2001).

[5] American Thoracic Society. *Diagnosis and initial management of nonmalignant diseases related to asbestos*. Am. J. Respir. Crit. Care Med.;170(6):691–715 (Sept. 15 2004).

[6] Environmental Protection Agency. Airborne Asbestos Health·Assessment Update. Springfield VA: NTIS; Report No.: EPA/600/8-84/003F (1986).

[7] IARC, *Asbestos: Monograph on the Evaluation of Carcinogenic Risk to Man*. Lyon: International Agency for Research on Cancer; (1988); Straif K et al., *A review of human carcinogens—part C: metals, arsenic, dusts, and fibres.* Lancet Oncol.; 10(5):453-4 (May 2009).

[8] National Toxicology Program. Report on Carcinogens, Eleventh Edition. U.S. Department of Health and Human Services, Public Health Service (2005).

[9] Occupation Safety and Health Administration. Occupational exposure to asbestos; final rule. Federal Register; 59:40964-1162 (1994).

Commission (CPSC),[10] the World Health Organization[11] the Collegium Ramazzini,[12] and the World Trade Organization.[13] This scientific consensus is also reflected in the Consensus Report of the 1997 Helsinki Conference,[14] publications from the American Cancer Society,[15] and publications from the National Cancer Institute of the National Institutes of Health.[16]

4. Most recently, IARC published an update on asbestos that concluded "all forms of asbestos

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[10] Consumer Product Safety Commission. CANCER HAZARD! CPSC Warns About Asbestos in Consumer Products: Safety Alert. Report No.: CPSC Document #5080 (1994).

[11] World Health Organization. Environmental Health Criteria 203: Chrysotile Asbestos. Geneva: World Health Organization; (1998); World Health Organization. Elimination of asbestos related diseases. Ref Type: Generic (2006); World Health Organization. Environmental Health Criteria 53: Asbestos and Other Natural Mineral Fibres. Geneva: World Health Organization; (1986).

[12] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban*. Am. J. Indust. Med. 54:168–173 (2011).

[13] World Trade Organization. European Communities – Measures Affecting Asbestos and Asbestos – Containing Products. Report No.: WT/DS135/R (2000).

[14] Tossavainen, A., *Asbestos, asbestosis, and cancer: the Helsinki criteria for diagnosis and attribution*. Scand. J. Work Environ. Health: 23(4):311-6 (Aug 1997).

[15] Malignant Mesothelioma. American Cancer Society. 10-19-2006. Ref Type: Pamphlet (2006).

[16] National Cancer Institute. Factsheet - Asbestos: Questions and Answers. Bethesda, MD, National Institutes of Health. Ref Type: Pamphlet (2003).

(chrysotile, crocidolite, amosite, tremolite, actinolite, and anthophyllite). . . cause[s] mesothelioma and cancer of the lung, larynx, and ovary. Also positive associations have been observed between exposure to all forms of asbestos and cancer of the pharynx, stomach, and colorectum."[17] IARC described its approach to assessing "causality":

> After the quality of individual epidemiological studies of cancer has been summarized and assessed, a judgment is made concerning the strength of evidence that the agent in question is carcinogenic to humans. In making its judgment, the Working Group considers several criteria for causality (Hill, 1965). A strong association (e.g. a large relative risk) is more likely to indicate causality than a weak association, although it is recognized that estimates of effect of small magnitude do not imply lack of causality and may be important if the disease or exposure is common. Associations that are replicated in several studies of the same design or that use different epidemiological approaches or under different circumstances of exposure are more likely to represent a causal relationship than isolated observations from single studies. If there are inconsistent results among investigations, possible

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[17] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

> reasons are sought (such as differences in exposure), and results of studies that are judged to be of high quality are given more weight than those of studies that are judged to be methodologically less sound.
>
> If the risk increases with the exposure, this is considered to be a strong indication of causality, although the absence of a graded response is not necessarily evidence against a causal relationship. The demonstration of a decline in risk after cessation of or reduction in exposure in individuals or in whole populations also supports a causal interpretation of the findings.
>
> Several scenarios may increase confidence in a causal relationship. On the one hand, an agent may be specific in causing tumours at one site or of one morphological type. On the other, carcinogenicity may be evident through the causation of multiple tumour types. Temporality, precision of estimates of effect, biological plausibility and coherence of the overall database are considered. Data on biomarkers may be employed in an assessment of the biological plausibility of epidemiological observations.[18]

5. After defining asbestos as all forms of this fibrous mineral, IARC stated that the "causal association between mesothelioma and asbestos has been well established." *Id.* IARC also

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[18] IARC. Preamble to Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

discussed some unresolved questions such as potential differences in relative potency by fiber type and the issues of fiber length.

6. Mesothelioma is a tumor of the serosal linings of the chest (the pleura), the abdomen (peritoneum), the heart (pericardium) and testes (tunica vaginalis). The cells of the serosal membranes surrounding the lungs, abdomen, heart and testes are essentially the same, at a cellular level, and react to the presence of asbestos in the same manner. All forms of diffuse malignant mesothelioma, in any location in the body, can be caused by all forms of asbestos.

7. Based on the evidence available, more than fifty (50) countries have now banned the use of all forms of asbestos.[19], [20], [21]

8. I follow the same weight-of-the-evidence methodology used by IARC, WHO and ATSDR among others, in reaching my conclusions about the health effects of asbestos. I, like those entities and many others, have considered the scientific and medical evidence in its totality, and I reach the same conclusions reached by the mainstream. The following chart is helpful to

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[19] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases.* Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

[20] LaDou et al., *The Case for a Global Ban on Asbestos.* Environ. Health Perspectives 118:7 (July, 2010).

[21] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban.* Am. J. Indust. Med. 54:168–173 (2011).

understand the weight-of-the-evidence approach:

	Amosite	Crocidolite	Chrysotile
Cellular Damage	X	X	X
Genetic Damage	X	X	X
Animal Fibrosis	X	X	X
Animal Cancer	X	X	X
Human Asbestosis	X	X	X
Human Lung Cancer[22]	X	X	X
Human Mesothelioma	X	X	X

Information About the Hazards of Asbestos was Available from the Early Twentieth Century

9. Asbestos is a commercial term used to describe two families of naturally occurring minerals. Amphiboles, containing five fiber types and the serpentine variety, chrysotile, were materials known to the ancients. More than 4,000 years ago, pottery in Africa and Finland contained

[22] This chart is for demonstrative purposes only. The scientific community has recognized that asbestos is a cause of lung cancer for 60+ years, but asbestos is also an accepted cause of other cancers as discussed in IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

asbestos, and Finnish homes were known to contain asbestos rock to pack crevices in log huts. The lamps of the Vestal Virgins in ancient Rome had wicks made from asbestos so the lamps would burn continuously, as long as they were filled with oil. Various Roman historians noted slaves working in asbestos mines were not as healthy as others, and were thought to die young.[23]

10. Charlemagne, Emperor of the Holy Roman Empire, was said to have possessed a tablecloth woven of asbestos, and would astonish his guest by cleaning his tablecloth in a roaring fire.[24] Additional history of the early use of asbestos can be found in the paper by Abratt et al.[25]

11. By 1850 chrysotile deposits were known around Thetford, in Canada, and these deposits were again appreciated following a forest fire when in the mid- 1870s outcroppings of rocks were noted to not have burned. By 1876, some 50 tons of asbestos was being mined in Quebec and brought to market through a specially built railroad. By the 1950s, over 900,000 tons per

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[23] Selikoff, Irving J., and D.H.K. Lee. Asbestos and Disease. (Academic Press, New York 1978).

[24] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases*. Annual Rev. Public Health, 34: 4.l – 4.12 (2013).

[25] Abratt, Raymond P., Daniel A. Vorobiof and Neil White, *Asbestos and Mesothelioma in South Africa*. Lung Cancer. 45:S3–S6 (Supp.) (2004).

year were being mined with a value of almost l00 million dollars.[26]

12. In the early 1800s, asbestos was identified in South Africa,[27] particularly in the northwest area of Cape Province, and the name crocidolite was given to a blue-colored stone otherwise known as "wooly stone." Further interest did not occur until the 1880s and the first records of serious production did not take place until early in the twentieth century. The amount of asbestos produced was far less than from Canada, remaining below 10,000 tons per year until 1940. In the Transvaal of South Africa a different form of asbestos was mined and was called amosite, an acronym for the Asbestos Mines of South Africa. By 1970, some 80,000 tons per year of amosite was being produced. The mines from which the majority of amosite was derived were run by a small number of Europeans with 6,500 local workers of color.

13. Other locations with significant production of asbestos included Italy, Russia, the United States, Rhodesia (now Zimbabwe), and more recently, China. Italy was never a major producer of asbestos, not being able to compete with the larger quantities available in Canada. Russian production was substantial, rivaling that produced in Canada. Russian mines produce chrysotile and crocidolite. In the

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[26] Stayner et al., The Worldwide Pandemic of Asbestos-Related Diseases. Annual Rev. Public Health, 34:4.l–4.12 (2013).

[27] Selikoff, Irving J., and D.H.K, Lee. Asbestos and Disease. (Academic Press, New York 1978)

United States, deposits were mined in Vermont, Arizona, and California. Smaller deposits of anthophyllite were mined in North Carolina and Georgia. In Zimbabwe, mines became operative early in the twentieth century and reached a peak production of 95,000 tons.

14. China has become a major producer and rivals Russia in terms of asbestos production. In 2000, Russia led the world with 700,000 tons, followed by 450,000 tons from China and 335,000 tons from Canada. Canada recently halted production of asbestos. In 2000, the United States was producing only some 7,000 tons from mines in California and elsewhere, this from a worldwide production of 2,130,000 tons.[28] Not surprisingly, Russia and China accounted for most consumption of asbestos followed by Brazil, India, Thailand, and Japan. The United States used about 15,000 tons of asbestos in 2000, down from a peak of 775,000 tons per year in the early 1970s. At the present time, the United States imports even less.

15. On a per capita basis, as of about 2006, the greatest use of asbestos is in Russia and former Soviet Republic countries, and in Thailand. Among the countries with lowest per capita usage, other than in countries that have now banned asbestos, are Canada, the United States, and several others at one tenth of a kilogram per capita per year. Although on a per capita basis India ranks low, it stands fourth in

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[28] Tossavainen, A., Global *Use of Asbestos and the Incidence of Mesothelioma.* Int. J. Occup. Environ. Health. 10:22 (2004).

the world's total usage. China, while second in the world, has a relatively low per capita amount, given its large population base. Major use in the United States is for asbestos cement and roofing materials. In much of the rest of the world asbestos containing cement, construction materials, friction products, and textiles are made, used, and exported.

Commercial Uses of Asbestos

16. Although there has been historical use of asbestos, it was more a curiosity than a meaningful commercial material. This changed in the last half of the nineteenth century as asbestos began to be used in many commercial settings. For example, with industrialization and the use of steam to drive equipment, it was recognized that asbestos could serve a useful purpose as insulation material.

17. It became increasingly apparent that asbestos, because of its various properties, was extremely useful in many situations. Asbestos resists degradation under heat and cold, does not conduct electricity, and is extremely chemically resistant, including resistance to many industrial acids. Because of its heat, cold and chemical resistance asbestos was used in many products. Different types of asbestos were found especially useful for different purposes.

18. In the nineteenth century, the first systematic use of asbestos was for sealing and packing materials, soon followed by its use in the insulation for heat conservation. The manufacture of asbestos roofing felt and cement

came soon thereafter, as did the development of textile made from asbestos.[29]

19. Around the turn of the century asbestos containing cement pipe was produced, the asbestos allowing for added strength, creating lighter and thinner cement materials. The first use of asbestos as a brake lining occurred in 1906, and clutch facings were developed in 1918. In Great Britain a technique for spraying asbestos as a fireproofing material was developed in the early 1930s, and this technique was imported into the United States a few years later. Considerable use of asbestos was noted during the shipbuilding era in and around World War II. For the first time millions, including many women, were exposed to asbestos.

20. After World War II, asbestos was used as a material in plastics, in building materials such as joint compound, spackling, plaster, paint, asphalt, acoustic material, reinforcement for cement siding, and many other new uses. Asbestos was used for filtering wine, beer, and pharmaceutical products. Crocidolite asbestos was even used as a component of cigarette filters between 1952 and 1956.

21. Asbestos found its way into plasters and stuccos, was used in drilling mud for oil wells and other similar operations, and was used in automobile body under coatings. Yarns made

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[29] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases*. Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

from asbestos were used in a wide variety of ways, including rope, sewing threads, gas mask filters, wire covering, and for steam hoses, among others. Cloth made from asbestos was incorporated into blankets, mailbags, theater curtains and commercial products such as ironing board covers. Other consumer products, including hair dryers, toasters, play sand, and baby and adult talcum powders were shown to contain asbestos.

22. Construction materials containing asbestos included millboards, cements, laboratory table tops, electrical pump insulation and mountings, and flooring. Asbestos was found to be present in 3,000-4,000 commercial products.

23. Increasingly, the use of asbestos is being banned around the world. The current use of asbestos includes building supplies, such as roofing materials and asbestos cement pipes. Automobile brake components continue to contain asbestos, and asbestos cloth is still used in firefighting protective gear. For some countries the continued sale of asbestos is a significant economic issue. Even Canada has now, effectively, closed the Quebec asbestos mines. This is in the face of irrefutable evidence of the health hazards of all forms of asbestos, and continuing evidence, especially in developing countries, of no real "controlled use" of asbestos, including chrysotile.

24. With the ban of the use of asbestos in Japan, only developing countries continue to use large quantities of asbestos. China and India, for

example, continue to mine and use asbestos, the most frequent use being in construction materials. Thailand, another growing economic power in Southeast Asia, continues to use large quantities of asbestos as well. Encouragement for the use of asbestos in such countries comes from the West, where the hazards are increasingly well recognized and actions are being taken to reduce or eliminate the use of asbestos containing products.

Public Health Issues and the Uses of Asbestos

25. The world has a long history of asbestos use, with some suggestions of potential health hazards by the ancients. The real history, appreciating the hazards of asbestos, begins in the late 1890s.

26. The term pneumoconiosis, having been coined by Zenker[30] in 1867 after examining the lungs of a man with siderosis, was applied to an increasing number of dust diseases of the lung. In 1924, Cooke coined the term asbestosis.[31]

27. Morris Greenberg, who served as a medical member of the Inspectorate of Factories in Great Britain and is a scholar of the historical aspects of asbestos-related disease, wrote an excellent historical overview of the development of knowledge regarding the hazards of

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[30] Zenker, F.A., *Iron Lung-Siderosis Pulmonous*. Dtsc. Arch. Klin. Med. 2:116 (1867).

[31] Stayner et al., *The Worldwide Pandemic of Asbestos-Related Diseases*. Annual Rev. Public Health, 34: 4.1 – 4.12 (2013).

asbestos.[32] This article provides an excellent historical account of one aspect of the development of knowledge about the hazards of asbestos and the failings of some in the medical community.

28. In Great Britain, as early as 1898, the Lady Inspector of Factories made note of the fact that asbestos was causing disease among asbestos textile workers.[33] In 1899, Dr. Murray conducted a post-mortem examination on a young man in his mid-thirties who died of respiratory insufficiency. Dr. Murray reported, during the patient's hospitalization, that he was the tenth individual in his particular work area to die, and that his working brethren had all preceded him in death at a young age from similar problems. Dr. Murray noted the man had extensive interstitial fibrosis, and what was described as "curious bodies" in his lungs. In 1907, the autopsy findings, with commentary, were published and unfortunately concluded that proper ventilation was now thought to be in place to spare additional workers disease in

[32] Greenberg et al., *The Doctors and the Dockers*. Am. J. Ind. Med. 45:573 (2004); Greenberg, Morris, and T.A. Lloyd Davies. *Mesothelioma Register 1967–68*. Br. J. Ind. Med. 31:91 (1974).

[33] Annual Report of the Chief Inspector of Factories and Workshops for the Year 1898, Her Majesty's Stationery Office, p. 171 (1898).

the future.[34] Unfortunately, because this was far from correct.

29. In 1915 Collis, after giving a series of lectures, wrote up his findings on pneumoconiosis and discussed the problems of silicosis and asbestos-induced fibrosis, not yet called "asbestosis."[35] The term asbestosis was not used until 1924 when Cooke coined the term to describe pulmonary fibrosis due to the inhalation of asbestos dust.[36] By 1930, Merewether and Price wrote of the principles to protect workers in England,[37] and Lanza in the United States showed that suggested levels of asbestos in the late 1930s were often too high to protect workers.[38]

30. Although previously unnamed, the disease entities caused by exposure to asbestos were not unappreciated. In 1918, the Prudential Life Insurance Company, which insured workers in Canada and the United States, had called to its attention by one of its vice presidents, who was

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[34] Murray, H.M. Departmental Committee on Compensation for Industrial Disease, Minutes of Evidence, Appendices and Index, p. 127 (Wyman and Sons, London, 1907)

[35] Collis, E.L. *The Pneumoconiosis*. Publ. Health. 28:252–264 (1915).

[36] Cooke, *W.E. Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust*. Br. Med. J. 2, p. 147 (July 26, 1924).

[37] Merewether, E.R.A. and C.W. Price. *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry*. Her Majesty's Stationery Office (1930).

[38] Lanza, *Silicosis and Asbestosis*, Etiology, Symptoms, Diagnosis Oxford University Press, page 59 (1938)

a statistician, there was harm in breathing asbestos dust. At this point in time, Prudential ceased issuing policies on the life of asbestos workers.

31. Although not reported in the scientific literature until many decades later by Tweedale, relatively recent revelations written up revealed at least one major asbestos company in England knew, beginning in the 1920s their workers were dying of lung cancer and mesothelioma, and they worked diligently to suppress this information.[39]

32. Since 1930, and probably earlier, asbestos dust had been recognized as a hazard wherever visible dust could be seen. In 1930, Merewether and Price stated that "[i]f there is visible asbestos dust, then the invisible dust is in dangerous concentration."[40]

33. Beginning in 1946, the American Conference of Governmental Industrial Hygienists ("ACGIH") began publishing a list of Maximum Allowable Concentrations ("MAC") and later published Threshold Limit Values ("TLV") for various harmful substances, including asbestos. The first MAC for asbestos was set "without any review of research or data" and the committee wrote that the values were "not to be construed

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[39] Tweedale, G. From Magic Mineral to Killer Dust: Turner and Newall and the Asbestos Hazard. Oxford University Press (Oxford 2000).

[40] Merewether, E.R.A. and C.W. Price. *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry*. Her Majesty's Stationery Office (1930).

as recommended safe concentrations."[41] This TLV, designed only to reduce asbestosis, was "known to be inadequate when first proposed, was severely criticized between 1946 and 1968, but nonetheless was promulgated annually and remained unchanged until 1971."[42]

34. The protective measures necessary to prevent asbestos disease are the same for asbestosis, lung cancer, mesothelioma or other malignancy. A company that protected its workforce, their families and bystander co-workers against any asbestos-induced disease would have reduced the risk to its work force from all asbestos-induced diseases.

35. Since the beginning of the twentieth century the protective measures a company should take to protect its workforce from exposures to toxic dust have included:

    - Warning workers of dangerous health effects and how to avoid harm
    - Instructing workers on hazardous substances and giving out warning literature
    - Repeating instructions frequently

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[41] Egilman, et al, *The origin and development of the asbestos threshold Limit Value: scientific indifference and corporate influence.* Int. J. Health Serv., 25(4) :667–96 (1995).

[42] Egilman, et al, *The origin and development of the asbestos threshold Limit Value: scientific indifference and corporate influence.* Int. J. Health Serv., 25(4) :667–96 (1995).

- Posting warnings and providing constant supervision of working conditions
- Using proper ventilation and housekeeping
- Controlling dust at the place of origin to prevent inhalation and ingestion Substituting safer materials for more hazardous materials and/or processes
- Requiring showers and separate lockers for non-work and work clothing, and frequent cleaning of clothing
- Routine, periodic medical examination of the workers and notification of findings
- Use of respirators, as necessary

36. If implemented, these measures would protect the worker, bystander and other workers on the jobsite, and the workers' spouses and children from exposure to toxic substances that might be brought home on workers' clothes. It was reasonably foreseeable this could occur from at least 1930, and probably before.

37. It was for this reason – to give workers the knowledge of the need to protect themselves and their families – that Merewether and Price recommended the workers be given a "sane appreciation of the risk" of working with asbestos.[43]

[43] Merewether, E.R.A. and C.W. Price. *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry*. His Majesty's Stationery Office (1930).

38. Thirteen years before Merewether and Price wrote about the hazards of asbestos, Alice Hamilton, a pioneer of industrial hygiene and occupational medicine, made clear it is the job of the industrial physician to prevent occupational disease and factories very well may be poisoning neighborhoods: In a factory using "litharge and red lead" that was covered "with layers of these poisonous dusts," Hamilton described the plant manager, disappointed about her lack of excitement about the facilities:

> One of them finally brightened up, and said "Come and see this." I saw a wonderful air-washing machine, very expensive. He said "Every cubic foot of air is washed before it comes in." I felt like saying, "*You had better wash it before it goes out, or it will poison the neighborhood.*"[44]

39. In 1942, General Electric Co. and the State of Pennsylvania discussed methods to prevent

[44] Hamilton, Alice. *The Fight Against Industrial Diseases – The Opportunities and Duties of the Industrial Physician.* Pa. Med. J. Vol. XXI, No. 6, 378–381 (1918). It was recognized that companies should provide adequate medical facilities at work, that changes of work clothing should be furnished by the employer, that showers should be provided to reduce exposures, and that ventilation to remove hazardous dusts is recommended. *Id.* The need to keep clean work areas, to use wet methods, to use ventilation, to avoid dry sweeping during cleanup and to provide respirators was well known where toxic dusts were present. Miller, Grier. *The Health Hazards of Cigar Manufacturing with Suggestions for Obviating Them*. Pa. Med. J. Vol. XXI, No. 6; 360–364 (1918).

spreading workplace poisons beyond the workplace including shower baths, and separate street clothing and work clothing

40. By 1953, the Walsh-Healy Act similarly required showers, separate lockers for street clothes and work clothes, and other protections to prevent asbestos from leaving the jobsite and poisoning family members.

41. The first published suggestion of the relationship of asbestos exposure and lung cancer was by Drs. Lynch and Smith, making observations of workers at a South Carolina asbestos textile plant.[45] They did not have definitive proof this occurred, but by 1942, Hueper, then director of occupational cancer studies at the National Cancer Institute, concluded the available data was sufficient for him to write he felt asbestos caused lung cancer.[46] This was repeated in the scientific literature several times in the 1940s and early 1950s. In 1955, should there have been question in anyone's mind, Doll reported on lung cancer in excess in Great Britain due to asbestos.[47] Interestingly, this data came from the Turner and Newall Company, where lung cancer cases and pleural cancers had been

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[45] Lynch, Kenneth M. and W. Atmar Smith. *Pulmonary Asbestosis III: Carcinoma of Lung in Asbestos-Silicosis*. Am. J. Cancer. 24:56 (1935).

[46] Hueper, W.C. Occupation Tumors and Allied Diseases (C.C. Thomas, Springfield, 1942).

[47] Doll, Richard. *Mortality From Lung Cancer in Asbestos Workers*. Br. J. Ind. Med. 12 (2):81–86 (1955).

accumulating since the 1920s, but had not been previously reported.[48]

42. For the problem of mesothelioma, case reports began accumulating in the 1940s, and by the early 1950s there were studies relating asbestos to the development of this form of malignancy. The evidence linking cancer to asbestos was strong enough that the most prestigious medical journal in America, the Journal of the American Medical Association (JAMA) published an editorial on the topic in 1949.[49] The JAMA article serves as a benchmark for general acceptance that asbestos was a carcinogen. By the middle 1950s, asbestos was "known" as a cause of cancer[50] in the industrial hygiene community and it was clearly recognized that the Threshold Limit Values (TLVs) and Maximum Allowable Concentrations (MACs) were not aimed at preventing cancer. By 1958, the American Industrial Hygiene Association (AIHA) published that exposure to asbestos, including during gasket, packing and brake work, was

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[48] Tweedale. *The Rochdale Asbestos Cancer Studies and the Politics of Epidemiology: What You See Depends on Where You Sit*, Int. J. Occup. Environ Health 13 :70–79 (2007).

[49] Editorial, J.A.M.A., *Asbestosis and Cancer of the Lung*, (August 13, 1949). This editorial discusses pleural and lung cancer and considers both human and animal data.

[50] Cook, *Symposium on Threshold Limit – Present Trends in MAC's*. Ind. Hyg. Quarterly (Sept. 1956) (recognizing the TLVs hadn't addressed the "perplexing problems" of "cancerigens" and listing asbestos among the known causes of cancer).

associated with asbestosis and lung cancer.[51] The work of Wagner et al. (1960), in South Africa, clearly related exposure to crocidolite asbestos and the development of this disease and cited earlier cases.[52] Interestingly, the cases reported by Wagner included not only mineworkers, but also included non-occupational and environmentally-exposed patients.

43. Newhouse et al. (1965) reported mesothelioma from household and environmental exposures to asbestos, in addition to occupational exposures.[53] Environmental exposures can also apply to those living near asbestos utilizing facilities. Similar experiences have played out

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[51] AIHA Hygienic Guides, Asbestos (1958). The AIHA Hygienic Guides were available to anyone who wanted them for $0.25/each. It had been recognized that asbestos from brake linings, gasket and packing caused asbestosis as early as 1932. (Merewether, E.R.A. Memorandum on the Industrial Diseases of Silicosis and Asbestos, Her Majesty's Stationery Office (1932)).

[52] Wagner, J.C., C.A. Sleggs and P. Marchand. *Diffuse Pleural Mesothelioma and Asbestos Exposure in North Western Cape Province*. Br. J. Ind. Med. 17 (4):260–271 (1960) (reporting on cases of mesothelioma due to occupational, household and environmental exposures to asbestos).

[53] Newhouse et al, *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area*. Br. J. Ind. Med. 22 (4):261–269 (1965).

in Japan[54], Italy[55] and elsewhere. Lieben and Pistawka (1967), of the Pennsylvania Department of Health reported several cases from both neighborhood and household asbestos exposures that resulted in mesothelioma.[56] Anderson et al. (1979) and Anderson (1983) reported on familial exposure to asbestos and disease showing both non-malignant and malignant disease occurring in family members not otherwise exposed to asbestos.[57] Vianna and Polan is a particularly interesting epidemiological study documenting a substantially (ten times) elevated risk of mesothelioma in the wives or daughters of asbestos workers, one of whose husband worked

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[54] Kurumatani et al., *Mapping the Risk of Mesothelioma Due to Neighborhood Asbestos Exposure*. Am. J. Respir. Crit. Care Med. Vol 178. Newhouse, in London, showed, among other things, that a number of individuals developed mesothelioma simply from living near an asbestos utilizing facility.

[55] Barbieri et al., *Asbestos Fibre Burden in the Lungs of Patients With Mesothelioma Who Lived Near Asbestos-Cement Factories*. Ann. Occup. Hyg. 56(6) 660 – 670 (2012).

[56] Lieben, J. and H. Pistawka. *Mesothelioma and Asbestos Exposure.* Arch. Environ. Health. Apr. 14 (4):559, 559–563 (1967).

[57] Anderson, Henty A., R. Lilis et al. *Household Exposure to Asbestos and Risk of Subsequent Disease.* Dusts & Disease. 145–146 (R.A. Lemen and J.M. Dement eds., 1979); Anderson, Henry A., Ruth Lilis et al. *Asbestosis Among Household Contacts of Asbestos Factory Workers*. Ann. N.Y. Acad. Sci. 330: 387–399 (1979); Anderson, Henry A. *Family Contact Exposure*. Proceedings of the World Symposium on Asbestos 349–362 (Canadian Asbestos Information Center (1983)).

as a brake lining worker.[58] The scientific evidence consistently confirms there is no safe level of exposure to asbestos when it comes to the disease mesothelioma as evidenced by the report of Ruiz et al. (2011) discussing the wife of an auto brake mechanic with peritoneal mesothelioma.[59] NIOSH has recognized mesotheliomas have been caused with as little as one day's exposure.[60]

44. Over the years, studies have shown other forms of cancer can be caused by asbestos. While there continues to be some controversy, it is generally accepted that gastrointestinal tract cancers, laryngeal cancers, kidney cancers and ovarian cancers are all found in excess following exposure to asbestos, the risk increasing with increasing exposure.[61]

45. As more and more groups of individuals exposed to asbestos have been looked at, evidence of

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[58] Vianna, Nicholas J. and Adele K. Polan. *Non-Occupational Exposure to Asbestos and Malignant Mesothelioma in Women*. Lancet. 311 (8073):1061–1063 (1978).

[59] Ruiz et al. *Mesothelioma Peritoneal Maligno – Informe de un Caso y Revision de la Lituratura*. Rev. Med. Inst. Mex. Seguro Soc. 49(1):79–84 (2011).

[60] NIOSH, Revised Recommended Asbestos Standard, DWEW (NIOSH) Publication No. 77–169 (December 1976). Animal inhalation studies have demonstrated that a single day's exposure to chrysotile asbestos can cause mesotheliomas. Wagner et al., *The Effects of the Inhalation of Asbestos in Rats*, Br. J. Cancer 29: 252 (1974).

[61] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

asbestos-induced disease is found. While there clearly appears to be a threshold phenomenon with regard to the development of asbestosis, no such threshold appears to exist for asbestos-related cancers, although a dose-response relationship exists. Time since first exposure and individual susceptibility may also play a role in increasing the risk of mesothelioma.

46. While most studies of asbestos and the development of human disease have focused on individuals occupationally exposed, there is an increasing body of evidence that non-occupational exposure, usually called environmental or bystander exposure, can lead to the development of asbestos-related disease.[62] This is true for findings such as pleural plaques, where in Finland individuals living near an asbestos mine developed plaques with some regularity, but similar individuals in areas where no asbestos mines exist do not. Wagner et al.,[63] in their classic 1960 paper regarding mesothelioma, spoke to the issue of individuals with environmental exposure developing mesothelioma as fibers were moved from the site of extraction to enter the delivery

[62] Kivoluoto, R. *Pleural Calcification as a Roentgenologic Sign of Non-Occupational Endemic Anthophylite Asbestos*. Acta. Radiol. (Suppl.) 194:65 (1960); Newhouse, Muriel L. and Hilda Thompson. *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area.* Br. J. Ind. Med. 22 (4):261–269 (1965).

[63] Wagner, J.C. *Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province.* Br. J. Ind. Med. 17(4):260–271 (1960).

system, on their way to entering general commerce.[64]

47. In the United States, a current issue of environmental exposure is the situation in Libby, Montana, where a tremolite-containing vermiculite mine has injured workers and townspeople, and the product has caused additional disease after entering general commerce. [65]

48. A somewhat more specific phrase, either called household exposure or familial exposure, exists when family members develop asbestos-related disease. Anderson looked at family members of asbestos-exposed workers. Even family members moving into a contaminated household after the workers has stopped bringing in asbestos can lead to the development of the disease.[66]

49. It has also been long known that a prudent work practice to insure worker safety and health was to restrict exposures to toxic and harmful substances to the workplace where they could be controlled. For example, in 1913, Tolman

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[64] Pan et al., *Residential proximity to naturally occurring asbestos and mesothelioma in California*. Am. J. Respir. Crit. Care Med. 172:1019+1025 (2005).

[65] Peipins, Lucy A., Michael Lewin et al., *Radiographic Abnormalities and Exposure to Asbestos-Contaminated Vermiculite in the Community of Libby, Montana, USA*. Environ. Health Perspect. 111 (2):1753–1759 (2003).

[66] Anderson, Henry A., Ruth Lilis et al. *Asbestosis Among Household Contacts of Asbestos Factory Workers*. Ann. N.Y. Acad. Sci. 330:387–389 (1979).

and Kendall published their manual on methods for preventing occupational accidents and disease and emphasized the need to segregate work place exposures from the home environment:

> The importance of wearing suitable clothing on the premises should be strongly impressed upon workers in dangerous trades. The ordinary or street-clothes should be taken off and replaced by special suits to be worn during working hours. It is not sufficient for a working-suit, jacket or apron to be put on *over* the ordinary clothing. The working-suit should be taken off before the midday meal and before leaving the factory and exchanged for street clothes. . . . By removing the working-clothes before meals and before leaving the factory the poison is not carried into lunchrooms or into the homes of workers.[67]

50. Tolman and Kendall also stressed the importance of employers providing their workers with rooms for changing clothing which should include individual lockers and adequate washing facilities.

51. At the Fifth Conference of Industrial Physicians and Surgeons in 1918, Henry Field Smyth, another pioneer in toxicology and industrial hygiene, identified asbestos as an industrial

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[67] Tolman, W.H. and L.B. Kendall. SAFETY, Methods For Preventing Occupational and Other Accidents and Disease. **p. 249–249** (Harper & Brothers Publishers, New York & London, 1913).

hazard to be monitored.[68] At that same conference, all the major industrial hygiene steps mentioned by Merewether and Price (1930) were recommended including teaching the workers about: (1) the hazards of the workplace; (2) need for cleanliness and post-exposure bathing; and (3) the need for protective clothing.[69] The need to keep clean work areas, to use wet methods, to use ventilation, to avoid dry sweeping during cleanup and to provide respirators was well known where toxic dusts were present.[70] While some of the early literature discusses the concepts of worker protection in the context of other materials, it is clear the concepts applied to asbestos or any toxic dust.

52. ln 1943, in their Manual of Industrial Hygiene and Medical Service in War Industries, the United States Public Health Service emphasized the importance of providing changing rooms for "employees whose clothes are exposed to contamination with poisonous, infectious, or irritating material." The Manual further stated for workers using toxic substances, "work clothes should be provided

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68 Smyth et al. *A Preliminary Report on Dust Studies in Various Industries*. Pa. Med. J. Vol. XXI, No. 6; 365–368 (1918).

69 *See* Schereschewsky, J.W. *Some Medical and Surgical problems and their Solution*. Pa. Med. J. vol. XXI, No. 6:355+359 (1918).

70 Miller, T. Grier, *The Health Hazards of Cigar Manufacturing with Suggestions for Obviating Them*. Pa. Med. J. Vol. XXI, No. 6:360–364 (1918).

and laundered by the employer." The general acceptance of the need to segregate workplace exposures from the home is demonstrated by a memorandum written by Roy S. Bonsib, an industrial hygienist at the Standard Oil Company in 1948. Bonsib wrote:

> Appropriate work clothes, properly fitted and maintained, play a prominent part in an industrial worker's health and efficiency. This is especially true when persons are working with more or less toxic or carcinogenic materials or where cleanliness is a factor in the maintenance of product quality. Consequently, many of the more progressive industrial organizations, such as E.I. DuPont de Nemours & Company, the American Cyanamid Company and Borden Company, have for years supplied their employees with work clothing and have instituted a laundry service.[71]

53. In 1952, the United States Department of Labor issued safety and health standards concerning worker safety and that all contractors

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[71] Bonsib, Roy S., *Memorandum, Industrial Work Clothes: Their Provision and Laundering*. Medical Department, Standard Oil Company (N.J.) (January 28, 1948). (written for members of American Petroleum Institute Medical Advisory Committee). Eleven (11) years earlier, Bonsib, in a widely published memorandum, discussed the health hazards of working in dust-producing operations involving asbestos. Bonsib, Roy. S., *Memorandum*, Dust Producing Operations in the Production of Petroleum Products and Associated Activities – A Medico-Safety Survey, Medical Department, Standard Oil Company (N.J.) (July, 1937).

performing contract work under the Walsh-Healy Act. Walsh-Healy specifically regulated asbestos as harmful and required the contractor reduce exposures to asbestos below the TLV of 5 MPPCF. Among the health requirements was the provision that:

> Workers who handle or are exposed to harmful materials in such a manner that contact of work clothes with street clothes will communicate to the latter the harmful substances accumulated during working hours should be provided with facilities which will prevent this contact and also permit the free ventilation or drying of the work clothes while they are not in use. In any plant where it is necessary for both male and female employees to change clothes, separate dressing rooms should be provided.[72]

54. Segregation of work clothing contaminated with industrial dusts and chemicals from the home environment was recommended by the government and industry because it had been known since the 1930s introducing such substances into the home put the worker's family at risk for contracting disease.[73] For

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[72] Safety and Health Standards For Contractors performing Federal Supply Contracts under the Walsh-Healy Public Contracts Act, United States Department of Labor, at p. 25 (1952).

[73] Commonwealth of Pennsylvania: A Preliminary Report of the Dermatological and Systemic Effects of Exposure to Hexachloro-Naphthalene and Chloro-Diphenyl. Bureau of Industrial

example, in 1935, chloracne from exposure to polychlorinated biphenyl (PCB) was described in family contacts of a chemical worker who was employed in a PCB manufacturing facility. Similarly, in 1949, it was recognized a family member's exposure to beryllium from worker's clothing could result in non-occupational berylliosis.[74]

55. While it may seem like household exposures are low-level exposures, but often is not the case. As one asbestos company executive explained the nature of household exposure as he criticized a study discussing household exposures:

> Over and above other deficiencies in this study, is the <u>erroneous assumption</u> that household exposures to asbestos have been minimal in dose relationship concept. The precise opposite is more likely the truth. As recognized by Selikoff and others, the impregnation of drapes, rugs, furniture etc. with asbestos fibers and the constant resuspension of fiber in the respirable range creates an exaggerated hazard. Once asbestos is carried home by the workman, it

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Standards, Department of Labor and Industry, Hamsburg, PA, Special Bulletin 43, March 16, 1935 (cited in Anderson, Henry A. Household Exposure to Asbestos and Risk of Subsequent Disease. Dusts and Disease, Pathotox Publishers, Inc., Eds. Lemen and Dement, 1979 at p. 145).

[74] Eisenbud, M., *Non-occupational Berylliosis*. J. Ind. Hyg. Toxicol. 31:282–294 (1949) (cited in Epler, G.R. *Asbestos-Related Disease from Household Exposure*. Respiration. 39:229–240, 235 (1980)).

> accumulates in the home, and its presence in the home is likely to be permanent. Once it gets into the rugs, for example, it becomes resuspended by movements such as brushing and walking and therefore, family members are getting a 24-hour a day, 7-day a week, exposure, relatively speaking, rather than a partial exposure. Of greater concern is the fact that the entire population of the family, including the very young and the very old, are exposed. Experimental and clinical data on the induction of cancer establish that the very young are more susceptible to carcinogens.[75]

56. Anderson et al. (1979) found that living with an asbestos worker led to a seven-fold increase in radiographic evidence of asbestos abnormalities.[76]

57. It has long been known it is important to prevent toxic substances from leaving the workplace. Given the abundant evidence of the carcinogenic nature of asbestos, the lack of a safe level, and the knowledge that asbestos can contaminate the cars and homes of workers, companies involved in the manufacture, sale and/or use of asbestos or asbestos-containing products, should have provided work clothing,

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[75] Comments of Johns-Manville corp. with respect to Notice of proposed Rulemaking Occupational Exposure to Asbestos, Fed. Reg. (October 19, 1975) (emphasis in original).

[76] Anderson, Henry A., R. Lilis et al. *Asbestosis Among Household Contacts of Asbestos Factory Workers*. Ann. N.Y. Acad. Sci. Vol. 330:387–398 (1979).

showers and change rooms that prevented contamination of street clothing with asbestos.

58. The concept that there is no safe exposure to a carcinogen is neither a new or novel opinion in the industrial hygiene, medical and scientific community; rather the literature is loaded with physicians and scientists reaching that opinion. For example, in 1948 American Petroleum Institute recognized that there was no safe level above zero for benzene.[77] In 1956, one asbestos company scientist published his opinion that "it is prudent to set the standard for cancerigenic substances substantially at zero . . . and no considerations can justify allowing inhalation of any concentration which is avoidable."[78]

59. Recognizing that the TLVs had not been devised to protect against cancer, Stokinger suggested building a 100 - 500 times safety factor into the TLV that was set for non-cancer outcomes.[79] The TLV for asbestos required counting all

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[77] American Petroleum Institute Toxicological Review – Benzene (1948).

[78] Smyth, Jr., Henry F. *Improved Communication – Hygienic Standards for Daily Inhalation.* Am. Ind. Hyg. Quarterly. 17(2): 129–185 (1956) (Dr. Smyth was an employee of Union Carbide, which at the time was a major manufacturer of asbestos-containing phenolics and which later became a major miner and distributor of asbestos).

[79] For the 5 MPPCF TLV for asbestos, this would mean reducing the TLV to 10,000 PPCF – 50,000 PPCF. One company, Duponts, actually did create an in-house TLV for asbestos of 500,000 PPCF. E.I. Dupont de Nemours & Co., Memorandum, Engineering Department, (May 2, 1968) (setting TLV for "total dust" at 500,000 particles per cubic foot).

particles in the air if asbestos dust was being generated – *i.e.* the TLV counted all dust particles in a cloud containing asbestos. If Stokinger's safety factor proposal were applied to the 5 MPPCF TLV for asbestos and converted to the current counting method (f/cc), the asbestos TLV to protect against cancer would be either 0.06 f/cc (using the more protective 500 times safety factor) and 0.3 f/cc (using less protective 100 times safety factor).[80] Thus, in 1955, to protect against cancer, Stokinger's more protective cancer safety factor, if applied, would have advocated exposures less than today's OSHA PEL. It is important to recognize that by 1955, it was clear that the 5 MPPCF TLV wasn't even fully protective for asbestosis.

60. Again in 1964, the widely held belief there was no safe level of asbestos exposure was discussed

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[80] This calculation was performed assuming that 1 MPPCF = 6 f/cc and therefore 5 MPPCF = 30 f/cc, direct calculation based on conversion particles per cubic foot (assuming all particles were fibers) to fibers per cubic centimeter. 30 f/cc ÷ 100 = 0.3 f/cc and 30 f/cc ÷ 500 = 0.06 f/cc. The direct conversion of MPPCF to fibers/cc ignores the fact that the TLV was a total dust standard and, for any product other than pure asbestos, this calculation would underestimate the safety factor proposed by Stokinger. While I – and most scientists – recognize that the conversion factor adopted by NIOSH was not in any way reliable, the unfortunate fact remains that it was used to create the first OSHA standards. I use this conversion factor to illustrate that even using the least protective interpretation of the historic exposure guidelines, the approach suggested by Stokinger would have required greater protection than went into place for more than a decade under OSHA. This was due, in large part, to the political pressure exerted by the asbestos industry in the rulemaking process.

by several asbestos company scientists at a major meeting called the *Conference of the Biological Effects of Asbestos*. U.S. Rubber's medical officer expressed the opinion clearly and concisely:

> Our own conclusion, as we began seeing what was happening in our own process, was that *the only safe amount of asbestos dust exposure was zero* and that the efforts in terms of achieving that lay basically in engineering, and, secondly, in education. But as far as a safe level of asbestos dust is concerned, our own conclusion in Hogansville, Ga., is that *there is no safe level. The safe level is nil and anything above the safe level represents certain risk.*[81]

61. A British company official offered his own thoughts at that same meeting: "*We do not believe there is any safe limit.* We have our own ideas as to how low we can get and we are always striving to get right down to zero. . . . we know there is no scientific basis for [the asbestos TLV of 5MPPCF] whatever."[82]

62. Despite the well-discussed weaknesses of the TLV, several companies continued to use the outdated, unsupported values to guide themselves and their customers. For example, despite having had personnel present at the

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[81] Wells, J. Discussion. Ann. N.Y. Acad. Sci. 132 (1)1–766 (1965) (reporting discussion at p. 336) (emphasis added).

[82] Addingley, C.G. Discussion. Ann. N.Y. Acad. Sci. 132(1)1–766 (1965) (reporting discussion at p. 335) (emphasis added).

1964 Conference on the Biological Effects of Asbestos, Union Carbide continued to distribute its "Asbestos Toxicology Report" from 1965 into the 1970s. This "Asbestos Toxicology Report" contained several misleading statements and inappropriately suggested that the TLV's mentioned were designed to protect against cancer. Particularly misleading was the following conclusion provided by Union Carbide's Industrial Medicine and Toxicology Department: "In conclusion, while asbestos dust in excess of the Threshold Limit Value is potentially harmful, as are many other dusts encountered in industry, it is readily controlled as other such dusts and it can be used safely with appropriate precautions."[83,84]

63. By the middle 1960s, anyone wanting to discover the hazards of asbestos, could have done so by simply going to a major library. For example, one Union Carbide salesman in the United Kingdom uncovered most of the widely accepted hazards of asbestos by simply going to the library.[85] Mr. Sayers indicated that there was "a growing feeling" that the Threshold Limit Value referred to in Union Carbide's Asbestos Toxicology Report was "no longer

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[83] Dernehl and Lane, Asbestos Toxicology Report, (1964) (produced by Union Carbide).

[84] Industrial Medicine and Toxicology Department, Union Carbide Corporation, Asbestos Toxicology Report, (May 5, 1969) (produced by Union Carbide).

[85] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.).

tenable."[86] Sayers also observed that mesothelioma "can occur in people with minimal fibrosis, *i.e.* only after a brief exposure, which may be as little as three months. Some authorities even believe that a single brief exposure might be sufficient."[87]

64. Mr. Sayers' visit to the library led him to conclude, among other things, asbestos caused asbestosis, mesothelioma and lung cancer and the TLVs for asbestos did not prevent disease, and the TLV for asbestos was, in fact, "an arbitrary choice, and had no experimental foundation." Sayers also recognized the "moral issue" surrounding the need to warn customers and others about the hazards:

> Moral Issues . . . on the basis of the present evidence, we are not entitled under any circumstances to state that our material [chrysotile asbestos] is not a health hazard. What is more, if it is believed that a potential customer would use our material 'dangerously', and that he is unaware of the toxicity question, then it must surely be our duty to caution him and to point out means whereby he can hold the asbestos air float to a minimum.

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[86] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.).

[87] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.); NIOSH, Revised Recommended Asbestos Standard, DWEW (NIOSH) Publication No. 77-169 (December 1976).

65. Sayers also was aware that of the opinion, expressed at the 1964 Conference on the Biological Effects of Asbestos, that "[t]he M.A.C. (Maximum Allowable Concentration) of 5 million particles per cubic foot is not now acceptable. Industry should aim at 1 million particles, and accept this figure with reservations until our knowledge in this field is extended."[88] On the basis of the foregoing, Sayers observed "[i]t thus appears that the sentence in Dr. Dernehl's Asbestos Toxicology Report: "It is now generally accepted that a man can work a 40-hour week for a lifetime without developing asbestosis, if the asbestos dust particle count is kept at or below 5 million particles per cubic foot of air is now no longer held to be true by a number of informed people."[89] Union Carbide's medical director, Dr. Carl Dernehl, agreed, stating that Sayer's memorandum was "reasonably accurate."[90]

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[88] Sayers, Ian, Memorandum, Asbestos as a Health Hazard in the United Kingdom, (Dec. 1967) (produced by Union Carbide Corp.).

[89] Sayers, Ian, Memorandum, *Asbestos as a Health Hazard in the United Kingdom*, (Dec. 1967) (produced by Union Carbide Corp.).

[90] Dernehl, Carl, Memorandum to Dr. T. J. Hall, [No Title] (June 7, 1967) (produced by Union Carbide Corp.). In this memoranda, the author points out that testing at the Mellon Institute revealed that Union Carbide's asbestos produced "the most severe reaction" in animal tests and "that it may be possible that our Coalinga product may be more hazardous to use than long fiber asbestos." Significantly, despite wondering whether 1 MPPCF would protect against mesothelioma, Union Carbide continued – for some time after this memoranda – to recommend to its

66. It has been documented in medical and scientific literature, for many decades, that medically significant exposures to asbestos thousands of times above background levels may not be visible to the naked eye. Breathing visible dust, however, from products containing asbestos reflects asbestos exposures not only well above background levels but also above the highest historic TLV, 5 MPPCF of asbestos-containing dust, a level that is generally not visible to the naked eye.[91] According to one asbestos company, 5 million particles per cubic foot "is generally not visible in the average work area unless a beam of light causing a Tyndall effect is present" and that "[u]sually the dust concentration must be from 8 – 10 million particles per cubic foot before its presence is visible in average lighting conditions."[92] Other experts during the pre-OSHA period reported that concentrations had to exceed 10 MPPCF before they would be become visible in a factory setting:[93]

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customers that keeping exposure below 5 MPPCF would prevent disease.

[91] *See*, Johnson, A.S. *No Halfway Measures in Dust Control*. National Safety Review. Vol. 32, No. 3:17–18 (1935).

[92] Union Carbide Corp., "Calidria" Asbestos SG-130 and SG-210 for Tape Joint Compounds (October, 1968).

[93] Hemeon, W.C.L. Plant and Process Ventilation. The Industrial Press (1955).

TABLE 1-8

Sight-Perception Dust Scale

(Visible Dust Concentrations in General Air)

Lighting	Perspective: Short Distances (less than 10 to 15 ft)	Perspective: Long Distances (30 to 200 ft)
	Concentration, Million Particles per cu ft	
Beam of sunlight, background relatively dark	less than 2 (no distance effect)	
Bright sunlight but no beam effect	10–20	2–5
Bright daylight "north" illumination (i.e., interior but no direct sun)	10–20	5–10
Low intensity daylight	20–50	10–20
Dim artificial light (night)	100–200	25–100

67. The 5 MPPCF TLV was never intended to protect workers from the cancer hazards of asbestos.[94,95] Thus, if someone worked in the presence of visible dust from an asbestos-containing product, the environment was greatly in excess of the *TLV for asbestosis*.

68. The first national standards regarding asbestos exposure were promulgated by the Occupational Safety and Health Administration (OSHA) based on a conversion from the TLV for asbestosis. Thus, the first permissible exposure limit (PEL) was recognized as not protective against cancer. Furthermore, the PELs were never intended to

[94] Schall, E.L. *Present Threshold Limit Value in the U.S.A. for Asbestos Dust: A Critique*. Ann. N.Y. Acad. Sci. 132 (1):316321 (1965).

[95] Stokinger, *International Threshold Limits Values – 1963.* Am. Indust. Hyg. Assoc. J. 25:5 469 – 474 (Sept. 1963) (stating "At present no threshold values for any carcinogen appear in the list of any country.").

be the maximum exposure "an employee may be exposed to without incurring the risk of adverse health effects."[96] Indeed, however, OSHA has made clear that even at the relatively low level of today's PEL (0.1 f/cc), the risk of asbestosis probably is eliminated and the risk of cancer is reduced but "a significant risk continues to exist."[97]

69. It is well established that take-home asbestos on workers' clothes, shoes, or hair can cause mesothelioma in household members living with the asbestos exposed worker.

70. These types of exposures and their resultant disease manifestations are outlined very effectively in the National Institute for Occupational Safety and Health Report to Congress on Workers' Home Contamination Study that was conducted under The Workers' Family Protection Act (29 U.S.C. § 671a).[98] In this report NIOSH concludes that:

> families of asbestos-exposed workers have been at increased risk of pleural, pericardial, or peritoneal mesothelioma, lung cancer.

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[96] Letter from OSHA (Dir. Of Compliance Programs, Richard Fairfax) to Ellman (May 13, 1999). See also 59 FR No. 153 at pg. 40966-7 (August 10, 1994).

[97] Letter from OSHA (Dir. Of Compliance programs, Richard Fairfax) to Ellman (May 13, 1999).

[98] National Institute of Occupation Safety & Health ("NIOSH"). Report to Congress on Workers' Home Contamination Study Conducted Under the Workers' Family Protection Act (29 U.S.C. 671a) (Sept. 1995) at 6–11, 45–46, 55, 62–63, 86–87, 145–59 tbls.2–6.

cancer of the gastrointestinal tract, and non-malignant pleural and parenchymal abnormalities as well as asbestosis.

71. It has been repeatedly and consistently demonstrated in the medical and scientific literature that family members exposed to asbestos dust from laundering a worker's clothing have a significantly increased risk of developing mesothelioma.[99]

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[99] Wagner, J.C., C.A. Sleggs et al. *Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province.* Br. J. Ind. Med. 17 (4):260–271 (1960); Newhouse, Muriel L. and Hilda Thompson. *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area.* Br. J. Ind. Med. 22:261–269 (1965); Leiben, J. and H. Pistawka, *Mesothelioma and Asbestos Exposure.* Arch. Environ. Health. 14:559–566 (1967); Champion, P., *Two Cases of Malignant Mesothelioma after Exposure to Asbestos.* Am. Rev. Respir. Dis. 103 (6):821–826 (1971); Lillington, G.A., R.J. Jamplis and J.R. Differding, Letter, *Conjugal Malignant Mesothelioma.* N. Engl. J. Med. 291 (11):583–584 (1974); Greenberg, Morris and T.A. Lloyd Davies, *Mesothelioma Register 1967–1968.* Br. J. Ind. Med. 31 (2):91–104 (1974); Anderson, Henry A., Ruth Lilis et al., *Household-Contact Asbestos Neoplastic Risk.* N.Y. Acad. Sci. 271:311–323 (1976); Li, F.P., J. Lokich et al., *Familial Mesothelioma After Intense Asbestos Exposure at Home.* JAMA. 240(5):467 (1978); Vianna, Nicholas J. and Adele K. Polan, *Non-Occupational*

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72. The publically available data would allow non-scientists, who had reason to make simple efforts, to discover the hazards of asbestos and to warn about them. Over the years, I have learned many companies in the business of making, selling and/or using asbestos products knew what the ancient Greeks knew: working with asbestos can be deadly. More recently, in 1967, a salesman for Union Carbide's asbestos business in the United Kingdom learned everything a worker needed to know from a trip to the library.[100]

73. While many of these events took place many years ago, it has never been acceptable to cause injury to others through commerce. Indeed,

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Exposure to Asbestos and Malignant Mesothelioma in Women. Lancet. 311 (8 073):1061–1063 (1978); Epler, G.R., M.X. Fitzgerald et al., *Asbestos-Related Disease from Household Exposure*. Respiration. 39 (4):229–240 (1980); Tagnon, I., W.J. Blott et al., *Mesothelioma Associated with the Shipbuilding Industry in Coastal Virginia*. Cancer Res. 40 (11):3 875–3879 (1980); Hammar, S.P., D. Bockus et al., *Familial Mesothelioma: A Report of Two Families*. Hum. Pathol. 20 (2):107–112 (1989); Roggli, Victor, *Mineral Fiber Content of Lung Tissue in Patients with Environmental Exposures: Household Contacts vs. Building Occupants*. Ann. N.Y. Acad. Sci. 643:511–518 (1991); Schneider, Joaquim, Kurt Straif et al., *Pleural Malignant Mesothelioma and Household Exposure*. Review Envron. Health. 11:65–70 (1996); Roggli, Victor. *Malignant Mesothelioma in Women,* Anat. Pathol. Chapter 8, pp. 147–163 (1997); Hillerdal, G., *Mesothelioma*: *Cases Associated with Non-Occupational and Law Dose Exposures*. Occup. Environ. Med 56 (8):505–513 (1999); Dodson, R.F., *Quantitative Analysis of Asbestos Buron in Women with Mesothelioma*. Am. J. Ind. Med. 43(2):88–195 (2003).

[100] Sayers, Ian. Asbestos as a Health Hazard in the U.K. Memorandum, Union Carbide Corp. (1967).

industry, including the asbestos industry, understood the need to test products for safety *before* putting them on the market. For example, in 1942, the Industrial Hygiene Foundation published the presentation of Francis Holden, made at the Seventh Annual Meeting of the Industrial Hygiene Foundation of America, Inc., wherein the author discussed the need for responsible companies to test products for safety: "Every new chemical or product should be investigated as to its toxicity before it is prepared in large amounts and released to the public."[101] Companies involved in the asbestos trade and/or use of asbestos had numerous avenues for testing of products. Henry Field Smyth examined the need to research hazards of new chemicals to "prevent injury to the health of workmen" . . . and to what extent the health of the public is being protected in the matter of keeping unsuitable chemicals out of the preparations it can purchase for its own discussed his work at one such facility, known as the Mellon Institute of Industrial Research:

> The prevention of occupational disease requires that knowledge of the potential hazards of the materials handled by workmen shall be readily available to industrial physicians and industrial hygiene engineers. . . .

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[101] Holden, Francis. What the Foundation Plant Surveys Are Disclosing, Meeting Report, Seventh Annual Meeting of the Members, Pittsburgh, PA, p. 62 (November 10–11, 1942) .

It is clearly the duty of every manufacturer to delay production of a chemical until the health hazards are well enough defined so that protection of his workmen is possible. It is also his duty not to sell a chemical for an application in which it would endanger the health of the public, and to inform customers, by proper labeling and otherwise, of the hazards of the compounds they buy. . . .

All producers of chemicals are probably aware of the problem which the flood of new materials presents to the industrial physicians and the hygienist. The matter is the responsibility of industry and in only rare instances is it proper to depend upon federal or state agencies to alleviate the situation. Several solutions have been evolved by single manufacturers and it is of interest to examine one of them in some detail. Eight years ago one firm established, at its own expense, an industrial fellowship under my direction at the Mellon Institute of Industrial Research of the University of Pittsburgh. The organization has grown steadily and we now have staff of 18 technically trained persons, and facilities to house about 3,500 animals, with further expansion visible in the near future.

By means of close contact with the research, production, and medical departments of this manufacturer our group is made aware of all new chemicals which it develops. . . .

> Upon all chemicals suspected of being potentially injurious to workmen or about which any doubt is entertained, we at once perform experiments designed to elucidate the situation. By means of tests upon small animals we investigate the hazard of swallowing, of skin penetration, of inhalation, of skin contact and of eye contact. . . .
>
> We refer to this procedure as a range finding test. It is performed in a short time and at a cost of only a few hundred dollars, and the results can be made known to the producer before the stage of pilot plant operation is reached. . . .
>
> After a time it may become apparent that the new material will be made and sold in larger quantities. Not until then is it appropriate to perform more detailed and expensive studies . . . which will reveal more precisely the quantitative hazards which must be guarded against in applications of the chemical, and the nature of the injury which overexposure may produce. When this evidence is published in the medical literature, our function is fulfilled in respect to the particular material, and the physician and hygienist are thus informed so that they can intelligently safeguard health.[102]

74. Responsible industry, beginning in the early twentieth century, began to undo the wrongs to

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[102] Smyth, Jr. Henry F. *Solving the Problems of the Toxicity of New Chemicals in Industry*. W.V. Med. J. 4:177–178 (1946).

workers and to stem the tide of occupational diseases. "It is management's responsibility to make sure that conditions are as safe as it is practicable to make them, and to insure that persons working with new compounds, processes and applications know the hazards involved and the precautions to be taken."[103] As one asbestos industry executive wrote in 1955:

> [t]o be sure, industry's awakening was a slow one. Fifty years ago a few leaders in industry attempted to improve the health and working conditions for employees. But it was just an attempt. The few efforts that were made were crude and isolated. And precious little financial support was offered. It is not surprising that progress was slow. Then the public's voice was heard. The public's growing concern for the health of the employee was forcibly brought to the attention of industry. There were just too many occupational diseases, too many tragedies in the mines, mills and factories. And to the great credit of industry, the problems were recognized.
>
> Industry no longer considered an employee mere chattel or commodity to be put on the block to be auctioned off to highest bidder. His dignity as a human being was being acknowledged.
>
> Public-spirited men of wealth endowed research institutions to probe into

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[103] Hine, C.H. and N. W. Jacobsen. *Safe Handling Procedures for Compounds Developed by the Petro-Chemical Industry*, Ind. Hyg. Quarterly. 15 (2):141–144 (1954).

> occupational hazards and diseases and to develop methods and procedures to improve the health of the individual, of the employee in industry, and conditions in the community.
>
> Progressive-minded companies established medical clinics. They pushed ahead with health and safety programs. The programs were, and still are, based on taking care of the physical and mental well being of employees, helping and protecting the consumer and promoting the common good.[104]

75. By 1955, the "typical" health and safety program included medical surveillance of workers, control of occupational hazards, on the job medical care, safety precautions and plant "medical, industrial hygiene and safety personnel coordinated by a headquarters health department."[105]

76. By the first half of the twentieth century, industry was "also aware of [its] responsibility to the consuming public. Today, the products of industry are designed to promote health and comfort of the public. . . . Today our industrial research organizations probe every health hazard. . . . [E]very effort is made nowadays to protect the consumer with safer products and better methods of handling them. And every safeguard is insisted upon before the product is

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[104] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 15 (November 16–17, 1955).

[105] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 16 (November 16–17, 1955).

marketed to the consumer."[106] Industry recognized that the obligation was to the employee, the users of products and also to protect the families of employees: "the employee's health is better, his morale is higher. He and his family live longer and more happily."[107]

77. Significantly, by the 1940s, industry was well aware of the need to warn anyone and everyone who might be exposed to a risk of harm. The Manufacturing Chemists Association (MCA) issued guidelines for how to appropriately warn users and purchasers of hazardous products.[108] The MCA, through its members, recognized that the best way to warn end users of chemicals was to label the hazardous materials. The MCA recognized the "need for furnishing the appropriate information in those cases were [the product at issue presents] hazards requiring special precautions. Precautionary information should, so far as practicable, reach every person using, handling, or storing hazardous

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[106] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 17 (November l 6–17, 1955.

[107] Fisher, A. R. The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 18 (November 16–17, 1955).

[108] Manufacturing Chemists Association, A Guide for the Preparation of Warning Labels for Hazardous Chemicals, Manual L-1 (1942).

substances."[109] As the National Paint, Varnish and Lacquer Association observed in 1939, "[t]he manufacturer or one who holds himself out to be a manufacturer must know the qualities of his product and he cannot escape liability on the ground that he did not know it was dangerous."[110] The MCA warning guidelines were well known to industry in the 1940s, as illustrated by this entry in the IHF's annual report:

> It is of primary importance that there be uniformity in labeling hazardous chemicals so that the exact type and degree of danger will be presented. The Manufacturing Chemists' Association Manuals L-1 and L-2 provide guidance. For mixtures, only the dangerous constituents need he mentioned. Under no circumstances should chemicals be over-labeled, i.e., the degree of hazard should not be exaggerated.[111]

78. Indeed, responsible "industry inspired, to a very great extent, the movement to label properly

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[109] Manufacturing Chemists Association, A Guide for the Preparation of Warning Labels for Hazardous Chemicals, Manual L-1 (6th Ed. I 961) at page 7.

[110] National Paint, Varnish and Lacquer Association, Inc., Memorandum Regarding Manufacturing Chemists Association Legal Principles (1939).

[111] Smyth et al., Summary on Conference of Chemistry and Toxicology, Eleventh Annual Meeting of Foundation Members, Transactions Bulletin No. 8 (1946).

certain types of products that might harm the consumer if he were not forewarned."[112]

79. By 1957 the MCA's guidelines regarding warnings were so widely known that anyone providing materials to the United States Navy was required, by military specifications, to include warnings based on Manual L-1.[113]

80. Even before the Navy expressly adopted the MCA's guidelines on warnings, adequate warnings were expected. The Navy regulations[114] included the following regulation:

> 7.8 REGULATION AND STATUTE MARKING.
>
> Special handling instructions and warnings shall be shown as required by the Interstate Commerce Commission regulations, U.S. Coast Guard regulations, Civil Aeronautics Board publications, and by statute.

81. In 1972, using essentially the identical guidelines published first in the 1940s, the MCA issued a proposed asbestos warning as follows:

> WARNING ! HARMFUL IF INHALED MAY CAUSE DELAYED LUNG INJURY (ASBESTOSIS, LUNG CANCER)

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[112] Fisher, A. R., The Economics of Industrial Health, Twentieth Annual Meeting, Industrial Hygiene Foundation, Transactions Bulletin No. 29, p. 17 (November 16–17, 1955).

[113] MIL-STD-1298 (1957) incorporated the MCA Manu al L-1, *A Guide for Preparation of Warning Labels for Hazardous Chemicals*.

[114] MIL-STD-129A (1954).

> Do not breathe dust.
>
> Use only with adequate exhaust ventilation or approved respiratory protective devices.
>
> Remove dust and fibers from clothing only by vacuum cleaning. Clean work areas only with vacuum cleaners or wet cleaning methods."[115]

82. Despite the fact that guidelines were available, many companies included cautions that did not adequately inform the consumer. For example, Union Carbide, an asbestos mining and milling company, claims to have begun placing the following warning on its bags of asbestos: "WARNING - Breathing Asbestos Dust May Be Harmful. Do not breathe dust."[116] This warning was described as "the most innocuous warning [Union Carbide] could devise." This "innocuous" warning led the person in charge of Union Carbide's asbestos business to conclude that Union Carbide asbestos was as dangerous as being behind a plow in a very dry weather.[117]

83. All of the information above, with the exception of a few of the internal documents, was readily available to any company that cared to investigate the hazards of asbestos. As part of membership in the Industrial Hygiene Foundation (IHF), the National Safety Council (NSC), the American Ceramic Society (ACS), the

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[115] Best, George, Manufacturing Chemists Association Letter to Director Scannell. OSHA (March 15, 1972).

[116] Gould, Memorandum re King City - Asbestos Multiwall Bag Specifications (July 11, 1969)(produced by Union Carbide).

[117] Myers Deposition (April 9, 1982) at p. 62:20–24.

American Society of Mechanical Engineers (ASME), the Illinois Manufacturers Association (IMA), and the Asbestos Information Association/North America (AIA/NA) members received regular copies of those organizations' periodicals. Because these organizations, and many other industry-focused groups, published on medical, industrial hygiene and safety issues, members of these organizations actually received information about the hazards of asbestos.

84. The IHF, for example, regularly distributed abstracts – summaries of national and international medical, industrial hygiene and safety literature – beginning in the 1930s.[118] The IHF Digests summarized more than one hundred articles – from all over the world – detailing the hazards of asbestos. The IMA, a Chicago-based trade organization, was well aware of the hazards of asbestos in the 1930s and worked to shape the law of Illinois to reduce legal liability of its members resulting from occupational exposure to asbestos and silica. [119] Because asbestos disease and silicosis were so important to industrial concerns in the United States, organizations like

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[118] Air Hygiene Foundation of America. Inc., Officers, Committees, Member's and Purposes, information Circular No. 8 (1938) (stating that the organization "[p]rovides monthly abstracts summarizing current literature on occupational health subjects. This is an important labor-saver for company officials. Further, it insures executives against missing vital new developments."

[119] Industrial Review, Occupational Diseases, Heath, Comfort and Safety and Changes in the Blower Act, 9:105 (February, 1936).

the IMA routinely discussed these matters with their members.[120]

85. ASME's monthly publication, *Mechanical Engineering*, published numerous articles about asbestos and health before 1940.[121] ASME is one of the largest, most popular engineering societies.

86. Given the abundant information available to industry since the early twentieth century, that asbestos could cause disabling and fatal diseases, and including cancer since 1942, it is my opinion companies involved in commerce should have, at a minimum, been warning that asbestos could cause cancer and other asbestos-related disease.

<u>Product Defense Literature - Sometimes Called "Doubt Science" Published to Aid in the Defense of Lawsuits and Limit Regulation</u>

87. The earliest evidence of the creation of evidence to aid in the defense of asbestos lawsuits - "Doubt Science" - can be traced back to the 1930s. In 1935, The Temporary Organizing Committee for the Industrial Dust Problem (which ultimately

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[120] *E.g.*, Industrial Review, Book Ill on Silicosis, 10:118 (November, 1938) (discussing the IMA's receipt of The Pneumonokonioses (Silicosis) – Literature and Laws, Volume III and stating "[t]he work is invaluable to any industrial concern or professional authority dealing with silicosis.").

[121] *E.g.*, Willson, Frederick, *Dust Industry – Shop Methods and Equipment Effective in Controlling Dust Hazards*. Mech. Eng. 55:2 (1933); Dallavalle, J.M, *The Control of Industrial Dust – The Problem of Local Exhaust and General Ventilation*. Mech. Eng. 55:10 (October, 1933); Sayer, H.D. *Occupational Disease – Additional Responsibility Legislation Places on Industry*. Mech. Eng. 60:2 (1938).

led to the formation of the Industrial Hygiene Foundation) proposed that a group of companies with asbestos and silica dust "problems" work to set up "authoritative and approved standards for the control of industrial dusts which, if complied with by industries, or by industrial companies, will act as a defense against personal injury suits."[122] This memorandum from 1935 was a discussion of the origin of what later became known as the Threshold Limit Value ("TLV").

88. By 1973, the asbestos industry was privately admitting what they knew or should have known for many years: asbestos was a killer. For example, the AIA/NA secretary, Matthew Swetonic, wrote in a speech to the Asbestos Textile Institute "there is no doubt that the inhalation of substantial amounts of asbestos can lead to increased rates of various types of lung disease, including two forms of cancer. These are facts which cannot be denied, even if they do not apply in all circumstances and under all conditions."[123]

89. The speech, *Why Asbestos?*, provides insight into the mindset of asbestos companies in the asbestos industry. Mr. Swetonic, who later served as a public relations representative for the tobacco industry, explained the industry position:

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[122] Letter from E. R. Weidlein (Director of Mellon Institute) to Roger A. Hitchins (President, American Refractories Institute) (January 21, 1935).

[123] Swetonic, Why Asbestos – A Speech Before the Asbestos Textile Institute Arlington, Virginia, June 7, 1973, (produced by Union Carbide).

> In our original concept, the Association would limit its activities to providing accurate, unbiased information on asbestos and health to the press, to the public and to interested politicians and other government officials.
>
> Fortunately — and properly — the Association has had the wisdom to alter its original limited concept. Of its proper functions, and now endeavors to assume whatever activities and responsibilities it deems necessary to protect the interests of the asbestos manufacturing industry in the United States vis-à-vis asbestos health."[124]

90. The AIA/NA published numerous pamphlets aimed at providing some information to inform workers of the hazards, but those materials sought to downplay the hazards of asbestos and to create a false sense of security on the part of the employer that asbestos could be used safely with minimal effort.

91. Some aspects of the approach set forth in Swetonic's speech continue to this day. In efforts to avoid responsibility in court and to enable continued commerce in asbestos around the world, the asbestos industry has sought to cast doubt on the hazards of asbestos. Industry. and their lawyers have employed a steady stream of

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[124] Swetonic, Why Asbestos – A Speech Before the Asbestos Textile Institute, Arlington, Virginia, June 7, 1973, (produced by Union Carbide).

"Doubt Scientists" who publish Product Defense literature in industry-friendly journals.[125] [126]

92. Using tactics that closely resemble those used by the tobacco industry, the asbestos industry "continues to generate endless debate on the relative hazards of asbestos or different fiber type and dimension. In these debates industry spokespersons argue that some forms of asbestos are less harmful than others. However, epidemiological and statistical efforts to characterize relative cancer potencies for different asbestos fiber types and for fibers of different sizes have not been able to overcome limitations or the exposure data. Nor can these analyses account for the fact that in the real world exposure is almost always to mixtures of asbestos fibers of different types and sizes."[127]

93. In an effort to defeat liability claims, "the asbestos industry is to commission the publication of articles, primarily in toxicology journals, termed "product defense" articles. These articles are frequently sponsored by asbestos interests such as the defendants in personal injury asbestos litigation. They are distinguished from other science papers in that

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125 Michaels, *Doubt is their product. How industry's assault on science threatens your health*. New York: Oxford University Press (2008).

126 Michaels. *Manufactured uncertainty: Protecting public health in the age of contested science and product defense*. Ann NY Acad Sci 1076; 149 – 162 (2006)

127 Collegium Ramazzini, *Asbestos ls Still With Us: Repeat Call for a Universal Ban.* Am. J. Indust. Med. 54:168–173 (2011).

they are written by scientific consultants and consulting firms, who are paid substantial sums for their work.[128] All together, the Auto Industry, including Ford Motor Company, General Motors, Chrysler, Borg Warner and Honeywell, Inc. have paid tens of millions of dollars to employ expert witnesses to publish articles for use in product defense.[129]

94. More recently, Georgia Pacific LLC and other companies that made and sold asbestos-containing joint compounds have funded a series of articles, orchestrated and controlled by lawyers, in an effort to create a product defense. The role of lawyers and the legal department in creating these Product Defense articles was not disclosed and the failure to disclose these potential conflicts of interest was improper. The New York Supreme Court Appellate Division described the studies as follows:

> GP funded these studies in 2005 to aid in its defense of asbestos-related lawsuits. The studies were performed by experts from various organizations, who, among other things, recreated GP's historical joint compound product for the purpose of testing its biopersistence and pathogenicity. To

[128] Collegium Ramazzini, *Asbestos Is Still With Us: Repeat Call for a Universal Ban.* Am. J. Indust. Med. 54:168–173 (2011).

[129] LaDou et al., *The Case for a Global Ban on Asbestos*. Environ. Health Perspectives 118:7 (July, 2010) (indicating GM, Ford and Chrysler sponsored several paper written by product defense consultants and "paid almost $37 million between 2001 and 2008" for various services relating to the articles).

facilitate the endeavor, GP entered into a special employment relationship with Stewart Holm, its Director of Toxicology and Chemical Management, to perform expert consulting services under the auspices of its in-house counsel, who also was significantly involved in the pre-publication review process.

…

Holm co-authorized nearly all of the studies, which were intended to cast doubt on the capability of chrysotile asbestos to cause cancer. On the two articles that he did not coauthor, he and GP's counsel participated in lengthy "WebEx conferences" in which they discussed the manuscripts and suggested revisions. Despite this extensive participation, none of the articles disclosed that GP's in-house counsel had reviewed the manuscripts before they were submitted for publication. Two articles falsely stated that "[GP] did not participate in the design of the study, analysis of the data, or preparation of the manuscript." For articles lead-authored by David M. Bernstein, Ph.D., and co-authored by Holm, the only disclosure was that the research was "sponsored" or "supported" by a grant from GP. The articles did not disclose that Holm was specially employed by GP for the asbestos litigation or that he reported to GP's in-house counsel. Furthermore, there were no grant proposals, and Dr. Bernstein was hired by GP on an hourly basis. Nor did the articles reveal that Dr. Bernstein has been disclosed as a GP

> expert witness in NYCAL since 2009, that he had testified as a defense expert for Union Carbide Corporation in asbestos litigation, or that he had been paid by, and spoken on behalf of, the Chrysotile Institute, the lobbying arm of the Quebec chrysotile mining industry. Although GP belatedly endeavored to address the inadequacies of certain of its disclosures, its corrections failed to acknowledge its in-house counsel's participation and did not make clear that Dr. Bernstein's testimony as an expert witness preceded the publication of the first GP reformulated joint compound article in 2008.
>
> The foregoing constitutes a sufficient factual basis for a finding that the relevant communications could have been in furtherance of a fraud, and the motion court properly confirmed the recommendation directing in camera review of the internal documents. As the court remarked, it is of concern that GP's in-house counsel would be so intimately involved in supposedly objective scientific studies, especially in light of GP's disclosures denying such participation.[130]

The New York court described the consultants' work as "seeding of the scientific literature with

[130] *Matter of New York City Asbestos Litigation,* 2013 NY Slip Op 04127 (First Judicial Department, Decided June 6, 2013) (legal citations omitted).

GP-funded studies."[131] A list of the GP-funded studies follows:

- Brorby, Sheehan, Berman, Greene and Holm, *Re-Creation of Historical Chrysotile-Containing Joint Compounds*, INHALATION TOXICOLOGY, 20:1043-1053 (2008);
- Bernstein, Donaldson, Decker, Gaering, Kunzendorf, Chevalier and Holm, *A Biopersistence Study following Exposure to Chrysotile Asbestos Alone or in Combination with Fine Particles*, INHALATION TOXICOLOGY, 20:1009-1028 (2008);
- Bernstein, Rogers, Sepulveda, Donaldson, Schuler, Gaering, Kunzendorf, Chevalier and Holm, *The Pathological Response and Fate in the Lung and Pleura of Chrysotile in Combination with Fine Particles Compared to Amosite Asbestos Following Short-Term Inhalation Exposure: Interim Results*, INHALATION TOXICOLOGY, 22(11): 937-962 (2010);
- Bernstein, Rogers, Sepulveda, Donaldson, Schuler, Gaering, Kunzendorf, Chevalier and Holm, *Quantification of the Pathological Response and Fate in the Lung and Pleura of Chrysotile in Combination with Fine Particles Compared to Amosite-Asbestos Following*

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131 *Matter of New York City Asbestos Litigation,* 2013 NY Slip Op 04127 (First Judicial Department, Decided June 6, 2013).

Short-Term Inhalation Exposure, INHALATION TOXICOLOGY, 23(7): 372–391 (2011);

- Brorby, Sheehan, Berman, Bogen and Holm, *Potential Artifacts Associated with Historical Preparation of Joint Compound Samples and Reported Airborne Asbestos Concentrations*, J. OCCUP. AND ENVIRON. HYG., 8: 271–278 (2011);
- Sheehan, Brorby, Berman, Bogen and Holm, *Chamber for Testing Asbestos-Containing Products: Validation and Testing of a Re-Created Chrysotile-Containing Joint Compound*, ANN. OCCUP. HYG., 55(7) 797–809 (2011);
- Simmons, Jones and Boelter, *Factors Influencing Dust Exposure: Finishing Activities in Drywall Construction*, J. OCCUP. AND ENVIRON. HYG., 8: 324–336 (2011);
- Jones, Simmons and Boelter, *Development and Evaluation of a Semi-Empirical Two Zone Dust Exposure Model for a Dusty Construction Trade*, J. OCCUP. AND ENVIRON. HYG., 8: 337–348 (2011);
- Jones, Simmons & Boelter, *Comparing Two-Zone Models of Dust Exposure*, J. OCCUP. AND ENVIRON. HYG., 8: 513–519 (2011);
- Berman, Brorby, Sheehan, Bogen and Holm, *More on the Dynamics of Dust Generation: The Effects of Mixing and Sanding Chrysotile, Calcium Carbonate,*

and Other Components on the Characteristics of Joint-Compound Dusts, ANN. OCCUP. HYG., 56(7):852–867 (2012);

- Brorby, Sheehan, Berman, Bogen and Holm, *Exposures from Chrysotile-Containing Joint Compound: Evaluation of New Model Relating Respirable Dust to Fiber Concentrations*, RISK ANALYSIS (2012).

Testimony of Mr. Holm, the in-house Georgia Pacific, LLC scientist working for the legal department, confirmed that the Product Defense consultants who authored the above-mentioned articles were paid in excess of $7,800,000.[132] It appears that there we no "grants" and that the payments were fee-for-service arrangements.

95. Recently, it has come to light that two other articles by David Bernstein – also claiming to have been financed by a purported " grant" from asbestos litigation defendant Union Carbide nearly two decades after Union Carbide exited the asbestos mining and milling business – were the subject of extensive, secret lawyer communications between lawyers for Union Carbide and Bernstein.[133] Union Carbide,

[132] Holm Deposition (June 6, 2011) at 196:1 – 199:25.

[133] Union Carbide Privilege Log, *In re New York City Asbestos Litigation All Weitz & Luxenberg Cases in which Union Carhide Corporation is a Defendant*, Supreme Court of the State of New York (before the Hon. Sherry Klein Heitler) Index No. 40000/8 (2013). There are dozens of entries indicating the Dr. Bernstein discussed the published papers on Union Carbide's asbestos with lawyers for Union Carbide prior to publication.

through its attorneys, paid Dr. Bernstein and his co-authors "approximately $400,623.20."[134]

96. Phelka & Finley, *Potential health hazards associated with exposures to asbestos- containing drywall accessory products: A state-of the-science assessment*, CRITICAL REVIEWS IN TOXICOLOGY, 42(1): 1–27 (2012) was funded by Kaiser Gypsum, another asbestos defendant.

97. McCoy et al, *Mesothelioma in Drywall Finishing Workers*, Journal of ASTM Intern. Vol. 8 No.1 (2011) was written by Kim Anderson, a consultant to asbestos defendants who made and/or sold asbestos joint compounds, but the conflict was not disclosed. John Dement — whose data were used by McCoy, et al. — wrote that McCoy et al. used his data in an "unscientific and misleading manner."[135] Furthermore, Dement and Lipscomb wrote that McCoy, et al. summary is totally misleading, and their interpretation of our study is scientifically inappropriate."[136] In conclusion, Dement and Lipscomb wrote "[t]he

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134 Defendant Union Carbide Corporation's Response to Plaintiff's Interrogatories, *Legault v. Bayer Cropscience, Inc., et al.* In the Circuit Court of the 13th Judicial Circuit in and for Hillsborough County, Florida (May 9, 2012).

135 Dement and Lipscomb, *Discussion on "Mesothelioma in Drywall Finishing Workers*," by McCoy, M. J. Wolter, M. E., and Anderson, K. E, [Journal of ASTM International Vol. 8, No. 1 (2011), Paper ID JA1102786] (May, 2012).

136 Dement and Lipscomb, *Discussion on Mesothelioma in Drywall Finishing Workers*," by McCoy, M. J., Wolter, M. E., and Anderson, K. E. [Journal of ASTM International Vol. 8, No. 1 (2011), Paper 10 JA1102786] (May, 2012).

public health and environmental literature are increasingly inundated with publications whose major purpose is to create doubt and uncertainty in an effort to oppose regulations or support tort litigation. While honest scientific disagreement and debate are useful, the McCoy et al. publication and the response by Anderson appear more directed at manufacturing uncertainty rather than a balanced review and presentation of the scientific literature."[137]

98. Recently, David Bernstein and others published another Doubt Science piece that misleadingly claims was supported by a "grant" from an industry trade organization.[138] This article contains several unsupported conclusions and glaring errors which, given the misleading funding disclosure, suggest that bias may have played a role in shaping the conclusions. Additionally, documents disclosed in litigation indicate that the article was written completely by Dr. Bernstein and Dr. Dunnigan and that they were planning to recruit additional "prospective co-authors worldwide" to add their names and "acceptance of co-authorship." One of the co-authors, Allen Gibbs, added his name after the

[137] Dement and Lipscomb, *Discussion on Mesothelioma in Drywall Finishing Workers*," by McCoy, M. J., Wolter, M. E., and Anderson, K. E. [Journal of ASTM International Vol, 8, No. 1 (2011), Paper ID JA1102786] (May, 2012) (citing Michaels et al., *Manufacturing Uncertainty: Contested Science and the Protection of the Public's Health and Environment*. J. Public Health, Vol. 95,2005, pp. S39–S48).

[138] Bernstein et al., *Health risk of chrysotile revisited*. Crit. Rev. Toxicol. 43(2) 154–183 (2013).

"several (6) drafts" mentioned below and testified as follows:

Q. How many hours did you spend working on this paper?

A. It's quite a long paper, so there was quite a lot to read. Probably five or six hours.

Dr. Gibbs claims to have contributed to the section on asbestos exposure at the GARCO facility in South Carolina, but admitted that section contained serious errors. Essentially, Dr. Bernstein and Dr. Gibbs attempt to blame the mesothelioma cases in workers from an asbestos textile facility on asbestos wafting over from the Navy Yards. Specifically, Gibbs admits there is a "major problem with [his] theory." When questioned on the inaccuracies, Dr. Gibbs appeared to be unwilling to commit to correcting the serious errors:

Q. Sir, don't you think that the misrepresentations in the paper should be corrected for the record'?

A. Possibly, yes.

To date, I am unaware of any such corrections being made.

<u>Substantial Epidemiological Data Supports the Consensus that All Types of Asbestos Can Cause Mesothelioma in Humans</u>

99. In addition to these consensus documents from national and international agencies, numerous peer-reviewed epidemiological studies, meta-analyses, reviews and reports also conclude that

chrysotile asbestos causes mesothelioma.[139] Lemen provides an excellent summary of some of

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[139] Kanarek, *Mesothelioma from Chrysotile Asbestos: Update,* AEP Vol. 21, No. 9, pp. 688–97 (2011); Henley, S.J. et al., *Mesothelioma incidence in 50 states and the District of Columbia, United States*, 2003 – 2008. Int. J. Occup. Environ Health Vol. 19; 1 – 10 (2013); Elliott et al., *Lung cancer mortality in North Carolina and South Carolina chrysotile asbestos textile worker*s. Occup. Environ. Med. 10.1136 (2012); Li et al., *Cohort studies on cancer mortality among workers exposed only to chrysotile asbestos: a meta-analysis*. Biomed. Environ. Sci. 17(4):459–468 (2004); Loomis et al., *Lung cancer mortality and fibre exposures among North Carolina asbestos textile workers*. Occup. Environ. Med. 66:535–542 (2009); Hein et al., *Follow-up study of chrysotile textile workers: Cohort mortality and exposure-response*. Occup. Environ, Med. 64:616–625 (2007); Silverstein et al., *Developments in asbestos cancer risk assessment*. Am. J. Ind. Med. 52:850–858 (2009); Finkelstein et al., *Mesothelioma among employees of a Connecticut factory that manufactured friction materials using chrysotile asbestos*. Ann. Occup. Hyg. 54:692–696 (2010); Egilman et al., *A case of occupational peritoneal mesothelioma from exposure to tremolite-free chrysotile in Quebec. Canada: A black swan case*. Am. J. Ind. Med. 54:153–156 (2011); Pira et al., *Mortality from cancer and oilier causes in the Balangero cohort of chrysotile asbestos miners*. Occup. Environ, Med. 66:805–809 (2009); Mirabelli et al., *Excess of mesotheliomas after exposure to chrysotile in Balangero, Italy*. Occup. Environ. Med. 65:815–819 (2008); Turci et al., *Role of associated mineral fibres in chrysotile asbestos health effects: The case of Balangeroite*. Ann. Occup. Hyg.; 53:491–497 (2009); Everatt et al., *Occupational asbestos exposure among respiratory cancer patients in Lithuania*. Am. J. Ind. Med. 50:455–463 (2007); Madkour et al., *Environmental exposure to asbestos-response relationship with mesothelioma.* Eastern Mediterranean Health J. 15:25–38 (2009); Yano et al., *Mesothelioma in a worker who spun chrysotile asbestos at home during childhood*. Am. J. Ind. Med.;52:282–287 (2009); Baumann et al., *Pleural mesothelioma in New Caledonia: An acute environmental concern*. Cancer Detect Prey. 31:70–76 (2007); Baumann et al., *Pleural*

the most important epidemiological evidence regarding asbestos.[140]

100. The epidemiological evidence that all forms of asbestos cause human malignant mesothelioma is so convincing that a consortium of epidemiologic and public health groups recently came together to issue the following position statement:

> A rigorous review of the epidemiologic evidence confirms that all types of asbestos fibre are causally implicated in the

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mesothelioma in New Caledonia: Associations with environmental risk factors. Environ. Health Perspect. 119:695–700 (2011); Nishikawa et al., *Recent mortality from mesothelioma, historical patterns of asbestos use, and adoption of bans: A global assessment*. Environ. Health Perspect. 116;1675–1680 (2008); Welch et al., *Asbestos and peritoneal mesothelioma among college-educated men*. Int. J. Occup. Environ. Health., 11: 254–258 (2005); Lemen, *Asbestos in brakes: exposure and risk of disease*. Am. J. Ind. Med, 2004; 45(3):229–237 (2004); Frank et al., *Carcinogenic implications of the lack of tremolite in UICC reference chrysotile*. Am. J. Ind. Med. 34(4):314–317 (1998); Smith et al., *Chrysotile asbestos is the main cruse of pleural mesothelioma*. Am. J. Ind. Med. 30:252–266 (1996); Cullen, *Chrysotile asbestos: enough is enough*. Lancet. 351(9113):1377–1378 (1998); Landrigan et al., *The hazards of chrysotile asbestos: a critical review*. Ind. Health 37(3):271–280 (1999); Landrigan et al., *Collegium Ramazzini call for an international ban on asbestos*. Am. J. Ind. Med. 47(6):471–474 (2005); Stayner et al., *Occupational exposure to chrysotile asbestos and cancer risk: a review of the amphibole hypothesis*. Am. J. Public Health 86:179–186(1996).

140 Lemen, Asbestos: Risk Assessment, Epidemiology, and Health Effects. 2d Ed., Chapter 5, *Epidemiology of Asbestos-Related Diseases and the Knowledge that Led to What is Known Today*, pages 131 – 267, Boca Raton: Taylor and Francis (2011).

> development of various diseases and premature death. Numerous well-respected international and national scientific organizations, through an impartial and rigorous process of deliberation and evaluation, have concluded that all forms of asbestos are capable of inducing mesothelioma, lung cancer, asbestosis and other diseases. These conclusions are based on the full body of evidence, including the epidemiology, toxicology, industrial hygiene, biology, pathology, and other related literature published to the time of the respective evaluations. . . .
>
> [A]n Italian chrysotile mining cohort in Balangero, Italy, has been followed up over the years (Piolatto, 1990; Mirabelli, 2008) and has demonstrated a statistically significant four-fold excess (6 cases vs. 1.5 expected) of pleural mesothelioma among blue-collar workers, and also among other classes of workers as well as among allied workers (Mirabelli, 2008). The chrysotile mined at Balangero was reported to be free of tremolite and other amphiboles).[141]

This position was endorsed by at least eight mainstream professional organizations, including the American College of Epidemiology, the American Public Health Association and the

[141] Position Statement on Asbestos from the Joint Policy Committee of the Societies of Epidemiology (JPC-SE) June 4, 2012.

Canadian Society for Epidemiology and Biostatistics.

101. Prior risk assessments looking at the potency of the various fiber types used unreliable and incomplete data about exposures and thus yielded unreliable data. A recent meta-analysis, using only epidemiological studies with more reliable data, yielded results which show that chrysotile is much more potent for causing mesothelioma than previously believed."[142] These authors recognize that "[a]sbestos is a well-known carcinogen responsible for cancer of the pleura and peritoneum (mesothelioma) and lung cancer. The profound consequence of historical exposure to asbestos is well documented in many countries. *Id.* (citing Lin et al., 2007).[143] Using the more accurate measurements, the authors of this risk assessment recommended lowering the exposure limit to 0.002 f/cc or 2% of the current PEL (0.1 f/cc) set by OSHA in the United States.

102. IARC's recent update on the carcinogenicity of asbestos points out the weaknesses, limitations

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[142] Burdorf et al., *Applying Quality Criteria to Exposure in Asbestos Epidemiology Increases the Estimated Risk*. Ann. Occup. Hyg., Vol. 55, No. 6, pp. 565–568 (2011) (discussing Gezondheidsraad, Asbestos—risks of environmental and occupational exposure, The Hague, the Netherlands: Health Council of the Netherlands, report 2010/10E (2010). Available at www.gezondheidsraad.nl/en/publications/asbestos-risks-environmental-and-occupational-exposure. Accessed March 28, 2012).

[143] Lin et al., *Ecological association between asbestos-related diseases and historical asbestos consumption: an international analysis*. Lancet, 369: 844–9 (2007).

and incomplete nature of two risk assessments, Berman & Crump (2003 and 2008) and Hodgson & Darnton (2000), that suggested large potency differences between amphibole forms of asbestos and chrysotile.[144] IARC pointed out that neither Berman et al. (2003 and 2008) nor Hodgson et al, (2000) considered the important data on chrysotile potency data from Loomis et al. (200) and Mirabelli et al. (2008). IARC also noted that "there is a high degree of uncertainty concerning the accuracy of the relative potency estimates derived from the Hodgson & Darnton and Berman & Crump analyses because of the severe potential for exposure misclassification in these studies." Significantly, IARC also found that the "Berman & Crump meta-analyses provided weak evidence that fibre length is a determinant of the potency of asbestos." Others believe that the disparity in results and methods renders quantitative risk assessments like these unreliable.[145] The lack of reliable exposure data

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[144] IARC. Monograph 100C: Asbestos (Chrysotile, Arnosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012) (discussing Berman et al., *Update of potency factors for asbestos-related lung cancer and mesothelioma.* Crit. Rev. Toxicol, 38: Suppl 11–47 (2008) and Hodgson et al. The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure. Ann. Occup, Hyg.. 44: 565–601 (2000).

[145] Elliott et al., *Lung cancer mortality in North Carolina and South Carolina chrysotile asbestos textile workers*. Occup. Environ. Med. :10.1136 (2012) (citing Greenland, Meta-analysis. In: Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd ed. Philadelphia: Lippincott Williams & Wilkins. 652e82 (2008) for proposition that the strong heterogeneity between

for most of the historic cohorts of asbestos exposed workers was a fundamental reason why the EPA abandoned its attempt to develop a "bin-specific" model for quantifying the danger of various types and sizes of asbestos fibers.[146] The weight of the evidence supports the conclusion and it is my opinion that all forms of asbestos cause mesothelioma, that the fibers of all lengths can contribute to the risk of disease and that the existing data is insufficient to *quantify* any differences in the relative potency of the types of asbestos for causing disease.[147]

<u>All Types of Asbestos Cause Lung Cancer and Asbestosis</u>

103. The Agency for Toxic Substances and Disease Registries (ATSDR) "assess[ed] all relevant toxicological testing and information that has been peer reviewed" and concluded in its 2001 Toxicological Profile on Asbestos that "[a]vailable evidence indicates that all asbestos fiber types

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cohorts underscores the potential differences between them and suggests a single estimate of effect may not be possible."). Berman himself has admitted to agreeing with eight criticisms of his methodology and only addressed two of them in the 2008 publication. *See* Berman, Wayne, Letter to Vivian Turner, EPA Science Advisory Board (1400F) re Comments on the Proposed Approach for Estimation of Bin-Specific Cancer Potency Factors for Inhalation Exposure to Asbestos (July 3, 2008).

146 Silverstein et al., *Developments in asbestos cancer risk assessment*. Am. J. Ind. Med. 52:850–858 (2009); Johnson S. 2008, Letter from Stephen L. Johnson, EPA Administrator to Or Agnes Kane, Chair of Science Advisory Board Asbestos Committee. 12/29/2009.

147 *Id*.

are fibrogenic".[148] The American Thoracic Society (ATS) also concluded in its 2004 statement Diagnosis and Initial Management of Non-Malignant Disease Related to Asbestos that all fiber types can cause lung fibrosis (asbestosis).[149] Recently, Loomis et al. (2010) reported on four textile plants using chrysotile asbestos that have shown an increased risk of both asbestosis and lung cancer, and the incidence of both diseases increased with increasing dose of asbestos.[150] Loomis et. al. also measured excess incidence of mesotheliomas among the various plants, including when plants that did not use commercial amphibole were excluded from the analysis.

104. Both the previously discussed toxicological data as well as the extensive human epidemiology prove that all forms of asbestos cause both lung cancer and asbestosis. ATSDR has concluded "[t]here is little doubt that all types of asbestos can cause lung cancer". For example, statistically significant increases in lung cancer mortality have been reported in workers exposed primarily

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[148] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological profile for asbestos. Atlanta: Agency for Toxic Substances and Disease Registry; 2001.

[149] American Thoracic Society. Diagnosis and initial management of nonmalignant diseases related to asbestos. Am. J. Respir. Crit. Care Med.; 170(6):691–715 (Sep 15 2004).

[150] Loomis D., Dement J., Richardson D, Wolf S. *Asbestos fibre dimensions and lung cancer mortality among workers exposed to chrysotile.* Occup. Environ. Med. 2010 Sep; 67(9):580-4.

to chrysotile".[151] The International Agency for Research on Cancer (IARC) has also concluded that chrysotile asbestos causes lung cancer in humans.[152] A recent meta-analysis by Li reaches the same conclusion.[153] Analysis of a chrysotile cohort in China also confirmed "that exposure to chrysotile asbestos is associated with an increased risk of death from lung cancer and asbestosis, and shows a clear exposure response relationship."[154] Asbestos may be more potent for causing lung cancer than some previously thought.[155] The evidence shows that even low level exposures to asbestos causes a substantial

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[151] U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological profile for asbestos. Atlanta: Agency for Toxic Substances and Disease Registry; 2001.

[152] IARC. Asbestos: Monograph on the Evaluation of Carcinogenic Risk to Man. Lyon: International Agency for Research on Cancer; (1988).

[153] Li L. Sun TD, Zhang X, Lai RN, Li XY, Fan XJ et al. *Cohort studies on cancer mortality among workers exposed only to chrysotile asbestos: a meta-analysis*. Biomed. Environ. Sci. 2004 Dec; 17(4):459–68.

[154] Deng et al., *Exposure-response relationship between chrysotile exposure and mortality from lung cancer and asbestosis,* Occup. Environ. Med. (2011).

[155] Gustavsson, *Low-Dose Exposure to Asbestos and Lung Cancer: Dose-Response Relations and Interaction with Smoking in a Population-based Case-Referent study in Stockholm, Sweden,* Am J. Epidemiol. 155 (11) (2002).

number of lung cancers in occupationally exposed workers.[156]

105. Pleural plaques are often considered to be markers for significant asbestos exposure. Recently, researchers in France found a statistically significant association between pleural plaques and mesothelioma.[157] The unadjusted hazard ratio (HR) = 8.9, 95% confidence interval [Cl] = 3.0 to 26.5 led Pairon et al. to conclude that '[t]he presence of pleural plaques may be an independent risk factor for pleural mesothelioma.' The greater the exposure to asbestos from brakes, the greater the likelihood of pleural plaques.[158] This makes sense because it is universally acknowledged that pleural plaques require greater exposures to asbestos than mesothelioma. Mechanics clearly have medically significant asbestos exposure in excess of that needed to cause mesothelioma.

<u>Other Medical and Scientific Evidence that All Types of Asbestos Cause Mesothelioma</u>

106. In addition to the extensive reliable epidemiological evidence that all types of asbestos cause mesothelioma in humans, there is substantial other evidence from animal studies

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[156] De Matteis et al., *Impact of Occupational carcinogens on lung cancer risk in a general population.* Int. J. Epidemiol. Advance Access (published March 31, 2012).

[157] Pairon el al., *Pleural Plaques and the Risk o*f Pleural *Mesothelioma.* JNCI (Advance Access January 25, 2013).

[158] Amielle et al., *Asbestos-Related Diseases in Auto Mechanics.* Ann. Occup. Hyg. 56(1) 55 – 60 (2012).

that supports my opinion that all types of asbestos cause mesothelioma in humans. Lung cancer and mesothelioma have been found in rats in inhalation studies. Although the results vary, at least one study, Wagner et al. (1974) found chrysotile caused as many cancers as crocidolite.[159] Proper scientific inquiry requires consideration of all forms of animal studies regarding asbestos exposure, including, inhalation, instillation and injection studies. While each of these types of studies has limitations, they also have strengths and must be considered. This is no different than the strengths and limitations of various types of epidemiological studies or, for that matter, all types of scientific evidence.

107. Numerous animal studies have demonstrated all forms of asbestos cause mesothelioma using both intrapleural and intraperitoneal injection."[160]

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[159] IARC. Monograph 1000: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite and Anthophyllite), Lyon: International Agency for Research on Cancer (2012) (discussing Wagner et al., *The effects of the inhalation of asbestos in rats*. Br. J. Cancer, 29: 252–269 (1974)).

[160] Wagner, *Experimental production of mesothelium tumours of the pleura by implantation of dusts in laboratory animals*. Nature, 196: 180–181 (1962); Wagner et al., *Mesotheliomas in rats following inoculation with asbestos*. Br. J. Cancer, 23: 567–581 (1969); Pott et al., *Relevance of non-physiologic exposure routes for carcinogenicity studies of solid particles. In: Toxic and Carcinogenic Effects of Solid Particles in the Respiratory Tract*. 4th International Inhalation Symposium Hanover 1 – 5 March, 1993. Mohr U, editor. Washington, D.C: ILSI-Press, pp. 109–125 (1993); Stanton et al., *Relation of particle dimension to*

Studies exposing animals via intratracheal administration have shown that asbestos fibers induced lung tumors in rats, and lung tumors and mesotheliomas in hamsters.[161]

108. At least one animal study, Kogan et al. (1987), demonstrated peritoneal mesothelioma in rats exposed to high doses of chrysotile asbestos via intragastric administration.[162] Tumors were seen in 18 of 75 exposed rats, between 18–30 months after the beginning of the experiment, including two peritoneal mesotheliomas, eight gastric adenomas, two gastric adenocarcinomas, one gastric carcinoma, one cancer of the forestomach, one small intestine adenocarcinorna, and three abdominal lymphoreticular sarcomas. No tumors were observed in 75 control animals.

109. Studies of asbestos-exposed pets have also confirmed a relationship between environmental

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carcinogenicity in amphibole asbestoses and other fibrous minerals. J. Natl. Cancer Inst. 67: 965–975 (1981).

[161] Pott et al., *Carcinogenicity studies on fibres, metal compounds, and some other dusts in rats*. Exp. Pathol: 32:129–152 (1987); Smith et al., *Long-term health effects in hamsters and rats exposed chronically to man-made vitreous fibres*. Ann. Occup, 31: 413731–754 (1987); Pott et al., *Lung carcinomas and mesotheliomas following intratracheal instillation of glass fibres and asbestos*. In: Proceedings of the VIth International Pneumoconiosis Conference 20–23 September 1983, Bochum, Germany: International Labour Office, pp. 746–756 (1984).

[162] Kogan et al., *Possibility of inducing glandular cancer of the stomach in rats exposed to asbestos*. Br. J. Ind. Med. 44: 682–686 (1937). Given the shorter lifespan of rats as compared to humans, high doses of potential carcinogens are often used to evaluate the carcinogenic potential of a substance.

exposure to asbestos and mesothelioma. A case control study showed an 8 fold (statistically significant) increased risk of mesothelioma in dogs with asbestos exposures as compared to those without asbestos exposure."[163]

110 In an article by Gemba et al.,[164] a significant number of mesotheliomas, both pleural and peritoneal, were found in the automobile manufacturing industry. As the article points out, friction materials and other automobile products contain predominantly chrysotile. This further supports the conclusion that chrysotile exposure gives rise to multiple types of mesothelioma.

111. This conclusion is supported by experimental data that shows that chrysotile is transported to the pleural and peritoneum, and animal experiments showing development of lung fibrosis and lung cancer. Suzuki demonstrated that chrysotile preferentially transported to mesothelial tissues, like the pleura, while amosite is more likely to be retained in the lung itself.[165] Fiber studies also show that asbestos, including chrysotile, is also transported to the peritoneum. Fibrosis has been produced in animals by inhalation or by intratracheal

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[163] Glickman et al., *Mesothelioma in pet dogs associated with exposure of their owners to asbestos*. Environ. Res. 32: 305–313 (1983).

[164] Gemba et al., *National survey of malignant mesothelioma and asbestos exposure in Japan*. Cancer Sci. 103 (3):483 – 90 (2012).

[165] Suzuki. *Asbestos tissue burden study on human malignant mesothelioma.* Ind. Health. 39(2):150–60 (Apr 2001).

exposure to chrysotile.[166] In addition, studies in animals have reported increased incidence of lung cancer following chronic inhalation exposure to chrysotile.[167] Exposure to chrysotile fibers less than 5 microns in length (short fibers) is reported to increase the incidence of lung cancer, with a dose-response relationship.[168] The animal data strongly suggest that chrysotile asbestos fibers themselves, rather than amphibole contamination alone, plays a role in causing mesothelioma.[169] The data do not support a claim that fibers less than 5 microns are inert or non-potent nor was the adoption of the 5 micron length cut-off for NIOSH/OSHA measurements based upon any conclusion that fibers less than 5 microns in length are harmless.[170] Indeed,

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166 O'Neill et al., *Lung Volume Changes in Rats Exposed to Chrysotile Asbestos*. Am. Rev. Respiratory Disease 123 (4) 146 (1981) ("Interstitial fibrosis was seen histologically in all exposed animals after one year and increased in severity during the year in air"). Purportedly tremolite-free Union Carbide brand asbestos produced similar results with less than half the dose.

167 IARC. Asbestos: Monograph on the Evaluation of Carcinogenic Risk to Man. Lyon: International Agency for Research on Cancer; (1988); World Health Organization, Environmental Health Criteria 203: Chrysotile Asbestos. Geneva: World Health Organization; (1998).

168 Stayner et al., *An epidemiological study of the role of chrysotile asbestos fibre dimensions in determining respiratory disease risk in exposed workers*. Occup. Environ, Med. 65(9):613–9 (Sep 2008).

169 Frank et al., *Carcinogenic Implications of the Lack of Tremolite in UICC Reference Chrysotile*. Am. J. Ind. Med. 34:314–317 (1998).

170 Lemen, *Asbestos in brakes: exposure and risk of disease*. Am. J. Ind. Med. 2004; 45(3):229–237 (2004); Dodson et al., *Asbestos*

NIOSH made clear the 5 micron counting protocol was a method of convenience because it used a readily available microscope and that it was "only an index of total fiber exposure and does not imply that shorter fibers do not pose a health hazard".[171]

112. Other relevant data on the ability of asbestos to cause human cancer include toxicokinetics (routes of exposure), deposition, clearance, and translocation in humans, molecular pathogenesis, and mechanisms of carcinogenesis.

113. Studies of extrapulmonary human tissues demonstrate that inhaled or ingested asbestos can reach most parts of the human body. For example, Auerbach et al. (1980) found asbestos in human kidney, heart, liver, spleen, adrenal, pancreas, brain, prostate and thyroid tissues.[172] Walls, et al. (2003) discussed a case of pericardial thickening and calcification where a pericardial biopsy "report showing the presence of 'numerous ferruginous (asbestos) bodies, some of which have the finely beaded appearance suggestive of

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Fiber Length as Related to Potential Pathogenicity: A Critical Review. Am. J. Ind. Med 44:291–297 (2003).

[171] NIOSH, Revised Recommended Asbestos Standard, DWIEW (NIOSH) Publication No. 77–169 (December 1976) (emphasis added).

[172] Auerbach et al., *Presence of Asbestos Bodies in Organs Other than the Lung*, Chest 77:2 pp, 133–137 (February, 1980).

asbestos.'"[173] I discuss additional findings of asbestos in extrapulmonary tissues below.

114. Several research organizations, including ATSDR[174] and IARC[175] have performed excellent reviews of the *in vivo* and *in vitro* evidence which supports a finding that all types of asbestos cause all the asbestos-related diseases, including mesothelioma (pleural, peritoneal, tunica vaginalis and pericardial). The *in vivo* and *in vitro* evidence overwhelmingly demonstrates that when asbestos comes in contact with mesothelial tissues, it causes the changes that can lead to mesothelioma.[176] Chrysotile asbestos, like all other types of asbestos, can and does cause various "mechanistic" events that are associated with mesothelioma, including the following: "impaired fibre clearance leading to macrophage activation, inflammation, generation of reactive oxygen and nitrogen species, tissue injury,

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173 Walls et al., *An uncommon clinical presentation of asbestos-related disease*, New Zealand Med. J. Vol. 116 No 1171 (2003)

174 U.S. Public Health Service, U.S. Department of Health & Human Services. Toxicological Profile for Asbestos. Atlanta Agency for Toxic Substances and Disease Registry; 2001 at Chapter 3 and 4. The profile was peer reviewed and "reflects the ATSDR's assessment of all relevant toxicologic information that has been peer reviewed."

175 IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012), sections 3 (Cancer in Experimental Animals) and 4 (Other Relevant Data).

176 Straif K et al., *A review of human carcinogens*—part C: *metals, arsenic, dusts, and fibres*. Lancet Oncol.; 10(5):453-4 (May 2009).

genotoxicity, aneuploidy and polyploidy, epigenetic alteration, activation of signaling pathways, [and] resistance to apoptosis."[177]

115. Substantial evidence shows that asbestos fibers of all types can be inhaled deeply into the lung due to their aerodynamic qualities. Once in the lung, asbestos fibers of all types may also interact with lung epithelial cells, penetrate into the interstitium, and translocate to the pleura and peritoneum or more distant sites. Fibers that are not efficiently cleared or altered by physicochemical process (e.g, breakage, splitting, or chemical modification) are termed bio-persistent in the tissue where they are found. Many animal studies have looked at bio-persistence of asbestos is various tissues. As discussed above, while animal studies are important scientific evidence, it is important to be cautious when interpreting the data from such studies, due to methodological issues and differences between species.[178] As a recent review observed, "[t]he relevance of bio-persistence to [malignant mesothelioma] in humans has also been questioned. Due to the prolonged latency associated with mesothelioma, the absence of fibres at autopsy, some 40 years after first exposure, is hardly surprising".[179]

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[177] *Id.*

[178] IARC Man-made vitreous fibres, IARC Monograph Eval Carcinogens Risks Humans, 81: 1-381 (2002).

[179] Linton et al., *The ticking time-bomb of asbestos: Its insidious role in the development of malignant mesothelioma.* Critical

These authors also cautioned regarding potential biases that can be interjected into animal models by preparation of samples. For example, Bernstein et al. were faulted for aggressively treating the asbestos fiber in a manner that would "markedly shorten the bio-persistence of fibres."[180]

116. While many investigators have looked at asbestos content in the lungs, lung asbestos content is less relevant to questions of mesothelioma causation than it is to questions of asbestosis and lung cancer causation; mesothelioma occurs in the mesothelial tissues around the lungs (pleura), the abdomen (peritoneum), heart (pericardium) and sex organs (tunica vaginalis).[181] Numerous

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Reviews in Oncology/Hematology 84:2 200–212 (September 2012).

[180] *Id.*

[181] See, e.g., *Warnock et al., Asbestos and the Pathology of Lung Cancer*. Chest; 89120–26 (1986) ("the pulmonary asbestos burden is probably not an accurate indicator of the degree of asbestos exposure"); Sebastien et al., *Asbestos Retention in Human Respiratory Tissues: Comparative Measurements in Lung Parenchyma and in Parietal Pleura*, in Biological Effects of Mineral Fibre. Vol. 1 Wagner, J.C., ed. (1980) (a lung asbestos count "is not a good indicator of pleural retention"); Suzuki et al., *Asbestos fibers and human malignant mesothelioma*, in *Advances in the Prevention of Occupational Respiratory Diseases*, Chiyotani, Hosoda, Aizawa, eds. (1998) (arguing that "asbestos fibers in the lung do not fully represent a total picture of asbestos exposure because translocated asbestos fibers are not retained in the lung,"); Suzuki et al., *Asbestos Tissue Burden Study on Human Malignant Mesothelioma*. Ind. Health 2001, 39, 150–60 (questioning the adequacy of approach of "researchers have been focusing almost exclusively on asbestos fibers in the lung tissue"); Dodson et al., 2008, *A Technical Comparison of Evaluating*

Asbestos Concentration by Phase-Contrast Microscopy (PCM), Scanning Electron Microscopy (SEM), and Analytical Transmission Electron Microscopy (ATEM) as Illustrated From Data Generated From a Case Report, Inhalation Toxicology, 20:723–732, (2008) (questioning the approach of looking at the lung when pleural or peritoneal cancer is at issue because "[w]ith respect to cancer, the concentration of asbestos at the site where the tumor starts is thought to be the most important factor in determining causation. It is impossible to know how much asbestos it takes to produce an asbestos-induced disease,"); Finkelstein, *Asbestos Fibre Concentrations in the Lungs of Brake Workers: Another Look*, Ann. Occup. Hyg. 52(6):455–461 (2008) (explaining that "since chrysotile is cleared from the lungs of brake workers, tremolite is arguably a better marker of exposure to Quebec chrysotile than is chrysotile itself"); Kohyama et al., *Analysis of Asbestos Fibers in Lung Parenchyma, Pleural Plaques, and Mesothelioma Tissues of North American Insulation Workers*. 643 Ann, N.Y. Acad. Sci. 27 (1991) (stating that "[d]espite the absence of high concentrations of chrysotile fibers in the lung, significant accumulation of chrysotile fibers in pleural and peritoneal tissues should be considered a potentially important factor in the induction of human malignant mesothelioma"); Baker. *Limitations in Drawing Etiologic Inferences Based on Measurement of Asbestos Fibers from Lung Tissue*, 643 Ann. N.Y. Acad. Sci. 61 (1991) (discussing the many problems with fiber burden analysis and criticizing fiber burden analysis as inadequate to estimate past exposures); McDonald et al., *The epidemiology of mesothelioma in historical context*. Eur. Respir. J. 9, 1932–1942. 1938 (1996) (discussing the potential problems and "substantial questions" of fiber burden analyses); Dufresne et al., *Fibers in Lung Tissues of Mesothelioma Cases Among Miners and Millers of the Township of Asbestos, Quebec*, Am. J lnd. Med. 27:581–592, 587 (1995) (explaining that "[b]ecause of the relatively low durability of chrysotile asbestos in lung tissues, it is difficult if not impossible to relate chrysotile lung content to asbestos-related diseases in humans"); Frank et al., *Carcinogenic Implications of the Lack of Tremolite in UICC Reference Chrysotile*, Am. J. Ind. Med. 34:314–317 (1998); Adib et al., *Short, Fine and WHO Asbestos Fibers in the Lungs of Quebec* investigators have looked at tissue beyond the lungs and found asbestos, predominantly chrysotile, in people with mesothelioma. Studies confirm that asbestos fibers are biopersistent and accumulate in lung tissue as well as lymph nodes.[182] Asbestos fibers have also been identified in the pleura following autopsy[183] and in the parietal pleural in samples collected during thoracoscopy.[184] Tissue asbestos measurements consistently show that chrysotile asbestos is related to human mesothelioma; there have been numerous reports of mesotheliomas in people where chrysotile is the only or vast majority of the fiber present.[185] Fundamentally, it is well

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Workers With an Asbestos-Related Disease, Am. J. Industr. Med. (Online Accepted 4 February 2013).

182 Dodson at al., *Asbestos content of lung tissue, lymph nodes, and pleural plaques from former shipyard workers*. Am. Rev. Respir. Dis. 142: 843–847 (1990); Dodson et at., *Measurements of asbestos burden in tissues*. Ann. N.Y. Acad. Sci. 1076: 281–291 (2006).

183 E.g., Dodson et al., *Asbestos content of lung tissue, lymph nodes, and pleural plaques from former shipyard workers*. Am. Rev. Respir. Dis. 142: 843–847 (1990); Gibbs et al., *Fibre distribution in the lungs and pleura of subjects with asbestos related diffuse pleural fibrosis*. Br. J. Ind. Med., 48: 762–770 (1991); Suzuki et al., *Asbestos tissue burden study on human malignant mesothelioma*. Ind. Health, 39: 150–160 (2001).

184 Boutin et al., *Black spots concentrate oncogenic asbestos fibres in the parietal pleura. Thoracoscopic and mineralogic study*. Am. J. Respir. Crit. Care Med. 153: 444–449 (1996).

185 Godwin, *Letter to the Editor: Asbestos and Mesothelioma*. 204 JAMA 151 (1968) (finding that "[a]nalysis of tissue by x-ray diffraction indicated that chrysotile was the only form of asbestos present."); Rogers et al., *Relationship Between Lung Asbestos*

Fiber Type and Concentration and Relative Risk of Mesothelioma: A Case-Control Study. 67 Cancer 1912 (1991) (reporting two eases of peritoneal mesothelioma with only chrysotile in their lungs, and two cases of mesothelioma with only chrysotile in their lungs with a history of exposure only to chrysotile.); Roggli et al., *Asbestos Fiber Type in Malignant Mesothelioma: An Analytical Scanning Electron Microscopic Study of 94 Cases*. Am. J. Ind. Med. 23:605–614 (1993) (concluding that "chrysotile along with its contaminant, tremolite — are capable of producing mesotheliomas in humans and experimental animals."); Dufresne et al., *Fibers in Lung Tissues of Mesothelioma Cases Among Miners and Millers of the Township of Asbestos, Quebec*. Am. J. Ind. Med. 27:581–592 (1995) (concluding that chrysotile (and its contaminant tremolite) were likely the cause of several cases of mesothelioma among this population."); Dodson et at., *Asbestos in Extrapulmonary Sites: Omentum and Mesentery*. Chest. 117; 486–493 (2000) (reporting that "[long fibers of chrysotile reached the momentum in several cases, which indicates that chrysotile is also translocated and could be potentially important in the pathogenesis of peritoneal mesothelioma."); Kohyama et al., *Analysis of Asbestos Fibers in Lung Parenchyma, Pleural Plaques, and Mesothelioma Tissues of North American Insulation Workers*. 643 Ann. N.Y. Acad. Sci. 27 (1991) (finding "fibrotic pleura and/or hyaline plaques of these workers were found to contain mainly chrysotile, the converse was true for the lung parenchyma. . . . [L]arge numbers of chrysotile fibers were detected in the extrapulmonary sites, such as in the pleural plaques and in pleural and peritoneal mesotheliomatous tissues."); Suzuki at al., *Translocation of Inhaled Asbestos Fibers From the Lung to Other Tissues*. Am. J. Ind. Med. 19:701–704, 702 (1991) (reporting "asbestos fibers detected in [a type of peritoneal fibrosis] were overwhelmingly chrysotile"); Suzuki et al., *Asbestos fiber and human malignant mesothelioma, in Advances in the Prevention-of Occupational Respiratory Diseases*, K. Chiyotani et al., eds. (1998) (indicating that "[t]he asbestos type seen in the mesothelial tissue was chrysotile alone in the majority (68/86; 79,0%)."); Suzuki et al., *Asbestos Tissue Burden Study on Human Malignant Mesothelioma*. Ind, Health 39, 150–160 (2001) (on review of lung and mesothelial tissue, the authors reported [c]hrysotile was the recognized and generally accepted that lung tissue fiber burden does not provide an accurate index of prior exposures to chrysotile asbestos.

117. Because mesothelioma occurs outside the lung, in peritoneum, pleura, and mesothelial tissue around the heart and testes, the tissue burden analysis of greatest interest is that of outside the lung. Auerbach, et al., (1980) investigated the translocation of asbestos throughout the body and found asbestos bodies in nine different organs including the heart.[186] Huang, et al. (1988) found asbestos in many different extrapulmonary sites.[187] In a series of papers,

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most common asbestos type detected in the mesothelial tissues. It was present in 62 of the 64 cases (96.9%); chrysotile was exclusively detected in 48 of the 62 cases (77.4%)."); Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma*. Ann, N.Y. Acad. Sci. 982:160–176 (2002) (finding six cases of mesothelioma (including one case of peritoneal mesothelioma) with solely chrysotile present in the lung tissue.).

[186] Auerbach et al. *Presence of Asbestos Bodies in Organs other then the Lung*, Chest 77: 2 (February 1980). The authors found asbestos bodies in the kidney, heart, liver, spleen, adrenals, pancreas, brain, prostate, and thyroid.

[187] Huang et al, *Asbestos Fibers in Human Pulmonary and Extrapulmonary Tissues*, Am. J. Indust. Med, 14: 331–339 (1988).

Suzuki et al. (2001;[188] 2002[189]; and 2005[190]) compared asbestos content of the lung tissue of mesothelioma victims and extra-pulmonary tissues. Asbestos is even found in stillborn infants where the likely route exposure was through the bloodstream of the mother.[191] Dodson et al. (2006) also discussed this evidence and additional findings.[192] Suzuki et al. (2002) found that

> In mesothelial tissues, chrysotile fibers were 30.3 times more common than amphiboles. . . . In some mesothelioma cases, the only asbestos fibers detected in either lung or mesothelial tissue were chrysotile fibers. . . . The average number of asbestos fibers in both lung and mesothelial tissues was two orders of magnitude greater than the number found in the general population. . . . The majority of

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188 Suzuki et al.. *Asbestos tissue burden study on human malignant mesothelioma*. Ind. Health. 39: 150–160 (2001).

189 Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma*. Ann. N.Y. Acad., Sci. 982: 160–176 (2002).

190 Suzuki et al., *Short, thin asbestos fibers contribute to the development of human malignant mesothelioma: pathological evidence*. Int. J. Hyg. Environ-Health 208: 201–210 (2005).

191 Hague, et. al, *Assessment of Asbestos Burden in the Placenta and Tissue Digests of Stillborn Infants in South Texas*, Arch, Environ. Contam. Toxicol, 35, 532–538 (1998).

192 Dodson et al., *Measurements of asbestos burden in tissues*. Ann. N. Y., Acad. Sci., 1076: 281–291 (2006).

> asbestos fibers in lung and mesothelial tissues were shorter than 5 um in length.[193]

Chrysotile asbestos "was exclusively detected in 55 of the 74 cases (74.3%)" of Suzuki's cases.[194] Based on those findings, Suzuki concluded:

> 1) Fiber analysis of both lung and mesothelial tissues must be done to determine the types of asbestos fibers associated with the induction of human malignant mesothelioma; 2) short, thin asbestos fibers should be included in the list of fiber types contributing to the induction of human malignant mesothelioma; 3) Results support the induction of human malignant mesothelioma by chrysotile.[195]

118. According to Suzuki et al. (2005), their data demonstrates that among asbestos types detected in the lung and mesothelial tissues, "chrysotile was the most common asbestos type to be categorized as short, thin asbestos fibers. . . . Compared with digestion technique of the bulk tissue, ashing technique of the tissue section was more effective to detect short, thin fibers. We conclude that contrary to the Stanton hypothesis, short, thin, asbestos fibers appear to contribute to the causation of human malignant

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[193] Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma*. Ann, N.Y. Acad, Sci. 982: 160–176 (2002).

[194] Suzuki et al., *Asbestos Fibers Contributing to the Induction of Human Malignant Mesothelioma*, Ann. N.Y. Acad. Sci. 982:160–176 (2002)

[195] *Id.*

mesothelioma." In Suzuki's lab, "such fibers were the predominant fiber type detected in lung and mesothelial tissues from human mesothelioma patients."[196] Gordon et al., examined the lymph node and lung tissues of 100 cases and found chrysotile-only in several cases and concluded that "mesotheliomas cannot be considered idiopathic or unrelated to chrysotile exposure when it is possible to identify the causative agent in the lungs and/or regional lymph nodes, regardless of the amount."[197] These findings suggest that it is not prudent to take the position that short asbestos fibers convey little risk of disease."[198] Sebastien et al. (1980);[199] Dodson et al. (2000a; 2000b; and 2003)[200] and Adib et al.

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[196] Suzuki et al., *Short, thin asbestos fibers contribute to the development of human malignant mesothelioma: pathological evidence.* Int. J. Hyg. Environ.-Health. 208: 201–210 (2005).

[197] Gordon et al., *Abstract, Asbestos Fiber Burden Analysis of Lung and Lymph Nodes in 100 Cases of Mesothelioma.* Am. J. Respir. Crit. Care Med. 179; A5892 (2009).

[198] Suzuki et al., *Short, thin asbestos fibers contribute to the development of human malignant mesothelioma: pathological evidence.* Int. J. Hyg. Environ.-Health. 208: 201–210 (2005).

[199] Sebastien et al.. Asbestos retention in human respiratory tissues: Comparative measurements in long parenchyma and in parietal pleura. In: Wagner. J.C., editor. Biological effects of mineral fibers. Lyon: IARC. p 237–246 (1980).

[200] Dodson et al., *Asbestos content in the lymph nodes of nonoccupationally exposed individuals*. Am. J. Ind. Med. 37: 169–174 (2000a); Dodson et al., *Asbestos in extrapulmonary sites. – Omentum and mesentery*. Chest. 117:486 493 (2000b): Dodson et al., *Asbestos fiber length as related to potential pathogenicity: A critical review*. Am J. Indus. Med. 44:291–297 (2003).

(2013)[201] further support a cautious approach to ignoring the effects of short, thin chrysotile fibers,

119. The above-referenced evidence led on group of reviewers to comment that "[a]sbestos fibers are found in all organs of subjects either occupationally exposed or not exposed to asbestos."[202]

120. Accordingly, it is generally recognized that a reliable occupational history — and not lung fiber burden studies — is the best indicator of past exposures to chrysotile[203] and that the absence of chrysotile on digestion, particularly at low magnification, does not provide a basis for concluding that an individual did not have a biologically significant exposure to chrysotile in the past.[204] "The best indicator of past asbestos exposure (the gold standard) remains the detailed past work history."[205]

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[201] Adib et al., *Short, Fine and WHO Asbestos Fibers in the Lungs of Quebec Workers. With an Asbestos-Related Disease*. Am. J. Ind. Med. (Online Accepted 4 February 2013).

[202] Miserocchi et al, *Translocation pathways for inhaled asbestos fibers*. Environ. Health 7:4; 1–8 (2008).

[203] Roggli et al., *Tremolite and Mesothelioma*. Ann. Occup. Hyg. 5:447–53 (2002).

[204] Baker, *Limitations in Drawing Etiologic Inferences Based on Measurement of Asbestos Fibers from Lung Tissue*. 643 Ann. N.Y. Acad. Sci., 61 (1991).

[205] Begin et al, *Detailed Occupational History - The Cornerstone in Diagnosis of Asbestos-related Lung Disease*, Am. J. Resp. Critical Care Med. 163 (3 pt 1 598–99 (2001).

<u>Human Case Reports Support the Conclusion that All Types of Asbestos Cause Human Mesothelioma</u>

121. Epidemiology is not required to reach conclusions regarding causation. For example, one tongue-in-cheek publication pointed out that medical science does not require an epidemiological study to know that the use of parachutes reduces the risk of death for people jumping out of airplanes.[206] It is also important to recognize that occupational and environmental epidemiology is a blunt instrument and is not, in most cases, well suited to examining precise dose-response relationships.

122. Because the consensus of the mainstream medical and scientific community is that, in North America and elsewhere, mesothelioma is a "signal tumor" or "signature tumor" with essentially one cause — asbestos — the scientific community has long considered individual cases of mesothelioma to be sentinel events. A sentinel event is a case of disease that, when it appears, signals the need for action. In 1983 Rutstein developed a list of Sentinel Health Events ("SHE-O") that are occupationally related.[207] Mesothelioma was included as a sentinel disease

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[206] Smith et al., *Parachute use to prevent death and major trauma related to gravitational challenge systematic review of randomised controlled trials*. Brit. Med. J. Vol. 327 (Dec. 23 – 27, 2003).

[207] Rutstein et al., *Sentinel health events (occupational): a basis for physician recognitions and public health surveillance*. Am. J. Pub. Health. 73:1054–61 (1983).

for asbestos exposure on the initial list of SHE-O, and has been included in all subsequent revisions. In fact, most asbestos scientists agree that the worldwide acceptance of mesothelioma as an asbestos-related cancer began with the case series published by Wagner in 1960.[208] When examining the question of causation of sentinel diseases like mesothelioma the scientific community recognizes that case reports and case series reports are useful and valid tools.

123. Moreover, unlike many other cancers, for which there are multiple, well-documented causal factors, mesothelioma is overwhelmingly caused by asbestos. "Mesothelioma is a rare cancer with one major etiologic exposure, therefore surveillance using each case as a sentinel event might seem more reasonable for this disease than for cancers with multi-factorial causation."[209]

124. Case series — such as Wagner (1960) — are particularly informative in situations where there are identified occurrences of very rare conditions for which there are few, if any, established causal factors. In fact, recognition of even a small number of eases of the "sentinel" diseases — such as liver angiosarcoma related to

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[208] Wagner et al., *Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province*. Br. J. Ind. Med. [17], 260–271. (1960).

[209] Teschke et al., *Mesothelioma surveillance to locate sources of exposure to asbestos*. Can. J. Public Health: 88(3):163–8 (May 1997).

vinyl chloride and malignant mesothelioma which is strongly related to asbestos exposure.[210]

125. The scientific community has concluded that, for sentinel diseases such as mesothelioma, case series reports can be sufficient by themselves to allow reliable conclusions to be drawn regarding causation. Again, as noted by Checkoway:

> "Case series reports can be virtually conclusive in their own right when the health outcome is a very rare disease or an uncommon manifestation of a relatively common condition."[211]

126. Not surprisingly, the medical literature contains numerous case reports of mesotheliomas caused by as little as a few months, weeks, or even days of asbestos exposure.[212] Over the past several

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[210] Checkoway et al., Research Methods in Occupational Epidemiology. 2nd ed. London: Oxford University Press; (2004).

[211] *Id.*

[212] See, e.g., Skarnmeritz et al., *Asbestos Exposure and Survival in Malignant Mesothelioma*: *A Description of 122 Consecutive Cases at an Occupational Clinic*. 2(4) J. Occup. & Environ. Med. 228, 228–29 (Oct. 2011); K. Browne & W.J. Smither, *Asbestos-related Mesothelioma: Factors Discriminating between Pleural and Peritoneal Sites*. 40 Br. J. Ind. Med. 145, 147 (1983) (in a study of 143 cases of mesothelioma, 32 cases were exposed for under one year, of whom 21 had no more than six months of exposure and 9 had no more than three months); Morris Greenberg & T.A. Lloyd Davies, *Mesothelioma Register 1967–68*, 31 Br. J. Ind. Med. 91, 96, 103 (1974) (documenting mesothelioma following an asbestos exposure of 3 weeks in one case and 1 day in another); 1965 Newhouse and Thompson Paper at 267 (documenting 2 cases of mesothelioma with 2 months or less exposure to asbestos); Maxwell Brow et al., *Critical Review, Mesothelioma following Exposure to Asbestos: A review of 72*

decades many case series of mesothelioma have been published, and some of these reports provide detailed exposure histories for the mesothelioma cases. Many of these cases of mesothelioma have had limited exposure to asbestos, either because the exposure was of a short duration or because it occurred in a scenario unlikely to generate high levels of airborne fibers. For example, Browne and Smithers,[213] in a study of 143 cases of mesothelioma, reported that 32 cases were exposed for less than one year, of whom 21 had no more than six months and 9 had no more than three months asbestos exposure. Greenberg and

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Cases. 64(5) Chest 641, 642 (1973) (documenting mesotheliomas in stock clerks who worked in areas "not heavily contaminated with asbestos" for 10 months and 18 months respectively). See also National Institute for Occupational Safety & Health, U.S. Department of Health & Human Services. Workplace Exposure to Asbestos, Review and Recommendations, Publication No. 81-103, 3 (1980) ("[A]ll levels of asbestos exposure studied to date have demonstrated asbestos-related disease, and a linear relationship appears to best describe the shape of the dose-response curve. These considerations led the committee to conclude that there is no level of exposure below which clinical effects do not occur. Third, the absence of a threshold is further indicated by the dramatic evidence of asbestos-related disease in members of asbestos-worker households and in persons living near asbestos-contaminated areas. These household and community contacts involved low level and/or intermittent casual exposure to asbestos. Studies of duration of exposure suggest that even at very short exposure periods (1 day to 3 months) significant disease can occur.").

[213] Browne et al. *Asbestos-related mesothelioma factors discriminating between pleural and peritoneal sites*. Br. J. Ind. Med., 40: 145–52 (1983).

Davies,[214] reporting on cases of documented mesothelioma from a mesothelioma register between 1967–68, found several with short duration of exposure: one case had only 1 day of exposure to sawing asbestos cement sheets (an activity known to cause exceptionally high concentrations of airborne asbestos dust); another case had limited household exposure through her husband who worked in an asbestos factory for only two years, and a third had intermittent exposure to asbestos through her brother's work over a 3 year period. Newhouse and Thompson[215] reported 2 cases of mesothelioma with 2 months or less exposure to asbestos in a case series from London. In 1973, Borow[216] reviewed 72 cases, which included 2 mesotheliomas in stock clerks who worked in areas not heavily contaminated with asbestos" for 10 months and 18 months respectively. In 2001, Neumann described the characteristics of 1,600 mesothelioma cases from the German mesothelioma registry from 1987–1999, and reported exposure as short as 1 month in one case. (The authors also reported that over 95% of all the cases had an elevated asbestos fiber burden.) Leigh et al, have described the

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214 Greenberg et al., *Mesothelioma register 1967-68*. Br. J. Ind. Med. 31(2):91–104 (Apr 1974).

215 Newhouse et al., Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. Br. J. Ind. Med. 1993; 50(9)769–78 (Sep 1965).

216 Borow et al., Mesothelioma following exposure to asbestos: a review of 72 cases. Chest. 64(5):641-6 (Nov 1973)

characteristics of mesothelioma cases from 1945–2002 from the Australian Mesothelioma Surveillance Program, and report that 3% of cases had exposures shorter than 3 months; the shortest duration of exposure for one case of mesothelioma was 16 hours of loading asbestos fiber on ships. (an activity known to cause exceptionally high concentrations of airborne asbestos dust).[217] Miller[218] reviewed the details of 32 mesothelioma cases attributed to household exposure; one case lived in the same boarding house as several shipyard workers for 8 years, another was a wife exposed to asbestos on her husband's clothes for only a year, and 3 others had household exposure less than 3 years. Hansen[219] described the pattern of asbestos-related disease in residents of Wittenoom Township in Australia, the location of a large asbestos mine. Twenty-four residents who had never worked in the mine developed mesothelioma by the time of this report; two had lived in Wittenoom for a very short time (6 weeks and 3 months) and had no other identified

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217 Leigh et al., *Malignant mesothelioma in Australia, 1945-2002*. Int. J. Occup. Environ. Health. 9(3):206–17 (Jul 2003)

218 *Miller, Mesothelioma in Household Members of Asbestos-Exposed Workers: 32 United Slates cases since 1990.* Am. J. Ind. Med.; 47:458–62 (2005).

219 Hansen et al., *Environmental exposure to crocidolite and mesothelioma: exposure-response relationships.* Am. J. Respir. Crit. Care Med.; 157(1):69–75 (Jan 1998).

exposure to asbestos. Ascoli[220] described a series of 79 cases, among whom two cases had exposure to asbestos solely through living or working in a building with asbestos insulation or roofing. Schneider[221] reported a case of mesothelioma with asbestos exposure documented through a fiber burden analysis of the lung; her only exposure to asbestos was working for three years in an office where asbestos has been sprayed onto steel beams exposed in the ceiling, and had no other exposure to asbestos. Chen[222] reported a similar case of mesothelioma in a man whose only exposure to asbestos was on visits to building sites in his role as executive of a building materials firm; asbestos exposure was documented through lung fiber analysis. Lemen (2004) reported, based on a review of the published literature relating to brakes, more than two hundred (200+) cases of mesothelioma in people exposed to chrysotile asbestos from brakes.[223] Consistent with these findings, Welch, et. al. published a small case-control study of college-educated men with peritoneal

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220 Ascoli et al., *Malignant mesothelioma in Rome, Italy* 1980–1995, *A retrospective study of 79 patients*. Tumori; 82(6):526–32 (Nov 1996).

221 Schneider et al. *Pleural Mesothelioma Associated with Indoor Pollution of Asbestos*. J. Cancer Res. Clin. Oncol. 127(2):123–7 (2001).

222 Chen et al. *Malignant mesothelioma with minimal asbestos exposure*. Hum. Pathol.; 9(3):253–8 (May 1978).

223 Lenten, *Asbestos in brakes: exposure and risk of disease*. Am. J. Ind. Med. 45(3);229–237 (2004).

mesothelioma and limited past exposures to asbestos, a finding contrary to the claim that asbestos-related peritoneal mesotheliomas only occur after high dose exposures to asbestos. These cases demonstrate that very limited exposure to asbestos is found in many case series of mesothelioma. Case reports and case series show that mesothelioma occurs in people with exclusively chrysotile exposure or with mostly chrysotile exposure.[224] A recent registry study

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[224] Enticknap et al., *Peritoneal Tumours in Asbestosis*, Br. J. Ind. Med. 21, 20 (1964); Godwin et al., *Letter to the Editor: Asbestos and Mesothelioma*. 204 JAMA 151 (1968); Champion, *Two Cases of Malignant Mesothelioma after Exposure to Asbestos*, 103 Am. Rev. Resp. Disease 821 (1971); Borow et al., *Mesothelioma following Exposure to Asbestos: A Review of 72 Cases*, Chest. 64;641–646 (1973)(finding all 72 cases of mesothelioma occurred since the mill had been using predominantly chrysotile and that "it has been shown clinically and experimentally that Chrysotile is a factor in the development of mesothelioma."); Acheson et al„ *Mortality of two groups of women who manufactured gas masks from chrysolite and crocidolite asbestos: a 40-year follow-up*. Br. J., Ind. Med. 39;344–348 (1982) (reporting a case of mesothelioma among employees at a factory that used only chrysotile); Cullen et al., *Chrysolite Asbestos and Health in Zimbabwe: I. Analysis of Miners and Millers Compensated for Asbestos-Related Diseases Since Independence*. (1980), Am. J. Ind. Med. 19:161–169 (1991) (finding two cases of mesothelioma among Zimbabwe chrysotile miners; one confirmed autopsy and a second probably case); Egilman et al., *Abuse of Epidemiology: Automobile Manufacturers Manufacture a Defense to Asbestos Liability*. Int. J. Occup. Environ. Health 11:360–371 (2005) (reporting new cases of mesothelioma out of a plant using predominantly chrysotile); Egilman et al., *A Case of Occupational Peritoneal Mesothelioma From Exposure to Tremolite-Free Chrysotile in Quebec, Canada: A Black Swan Case*. Am. J. Ind. Med. (2010) (reporting a peritoneal mesothelioma from exposure to asbestos

identified large numbers of pleural and peritoneal mesotheliomas with low-level chrysotile exposure in the Japanese automobile manufacturing industry.[225]

<u>There is No Safe Exposure to Any Type of Asbestos: Exposures Above Background Can Cause Mesothelioma in Humans</u>

127. There is no safe level of exposure to any type of asbestos fiber. Asbestos is genotoxic.[226] Genotoxic agents are recognized as having no safe level or threshold of exposure for carcinogenic effects.[227] This is not a new or novel opinion in the medical and scientific community; rather the literature is replete with physicians and scientists reaching that opinion. In 1956, one asbestos company scientist published his opinion that it is prudent to set the standard for cancerigenic [sic] substances substantially at zero . . . and no considerations can justify allowing inhalation of any concentration which is avoidable."[228]

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in a chrysotile mine which may not be contaminated with tremolite).

225 Gemba et al., *National survey of malignant mesothelioma and asbestos exposure in Japan*. Cancer Sci. 103 (3):483–90 (2012).

226 Strait K et al., *A review of human carcinogens--part C: metals, arsenic, dusts, and fibres*. Lancet 10(5):453–4 (May 2009) (Table: Metals, arsenic, dusts and fillers assessed by the IARC Monograph Working Group).

227 Patty's Industrial Hygiene (5th Ed.) Vol. 3 CH. 40 page 1872.

228 Smyth, *Improved Communication — Hygienic Standards for Daily Inhalation*. Ind. Hyg. Quarterly. 17(2) (1956) (Dr. Smyth was an employee of Union Carbide, which at the time was a major

128. In 1964, at a major medical conference on asbestos-related disease, another asbestos industry medical officer expressed the opinion clearly and concisely:

Our own conclusion, as we began seeing what was happening in our own process, was that *the only safe amount of asbestos dust exposure was zero* and that the efforts in terms of achieving that lay basically in engineering, and, secondly, in education. But as far as a safe level of asbestos dust is concerned, our own conclusion in Hogansville, Ga., is that there is no safe level. *The safe level is nil and anything above the safe level represents certain risk*."[229]

This echoes the work of Merewether et al. of several decades earlier.[230]

129. Experienced medical and scientific experts continue to agree that there is no safe level of exposure to asbestos. For example, in 2011, the Inspector General for the United States Environmental Protection Agency wrote that

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manufacturer of asbestos containing phenolics and which later became a major miner and distributor of asbestos).

[229] Wells, Ann. N.Y. Acad. Sci. 132 (1)1-766 (1965) (reporting discussion at page 336) (emphasis added).

[230] Merewether et al., *Reports on Effects of Asbestos Dust on the Lungs and Dust Suppression In the Asbestos Industry*. Her Majesty's Stationery Office (1930).

"[a]sbestos is a human carcinogen with no safe level of exposure.[231]

130. Studies show excess of mesothelioma with non-occupational exposures, which are generally understood to be lower doses that occupational exposures. These data in combination with the data that 90% or more of mesotheliomas have either a documented or demonstrated history of exposure or substantial asbestos in lung tissue, again suggest that the potential of causation by asbestos should be considered for every mesothelioma.

131. A large case-control study by Iwatsubo et al., found an excess of pleural mesothelioma in the lowest exposure group with an estimated total exposure between 0.001 and 0.49 yrs.[232]

132. Rödelsperger concluded there was a distinct dose-response relationship, even at extremely low levels of asbestos exposure, with exposures from >0 to <0.15 f/cc-yrs showing a significantly increased risk of mesothelioma.[233]

133. In 2000, Bourdès et al. reviewed the literature and performed a meta-analysis of the risk-of

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[231] USEPA, Office of Inspector General, Early Warning Report: Use of Unapproved Asbestos Demolition Methods May Threaten Public Health, Report No. 12-P-0125 (December 14, 2011).

[232] Iwatsubo et al., *Plueral mesothelioma: Dose response relation at low levels of asbestos in a French population-based case-control study*. Am. J. of Epidemiol. 148:133–142 (1998).

[233] Rödelsperger et al., *Asbestos and man-made vietreous fibers as risk factors of diffuse malignant mesothelioma: Results from a German hospital-based case-control study*. Am. J. Ind. Med. 39:262–275 (2001).

pleural mesothelioma from environmental exposure to asbestos.[234] Bourdès et al., identified eight relevant studies on the risk of pleural mesothelioma from household or neighborhood exposures to asbestos. These studies did not include the case-control studies outlined below. These authors found that the relative risks of pleural mesothelioma for household exposure ranged between 4.0 and 23.7. They also found a summary risk estimate of 8.1 (9.5% C1, 5.3–12). For neighborhood exposures, the relative risks reported ranged between 5.1 and 9.3 and the summary estimate was 7.0 (95% CI, 4.7–11). This analysis appears to be in agreement with the studies by Magnani et al.[235] and Rödelsperger et al. (see above). Bourdès et al. commented that their data were insufficient to estimate the magnitude of excess risk at the levels of environmental exposure commonly experienced by the general population in industrial countries (in other words, from the general environment).

134. Pan et al. (2005) performed a population-based study on the distribution of mesothelioma in California.[236] After attempted allowance for

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[234] Bourdès et al., *Environmental exposure to asbestos and risk of pleural mesothelioma: review and meta-analysis*. Eur. J. 16:411-417 (2000).

[235] Magnani et al., *Multicentrie study on malignant pleural mesothelioma and non-occupational exposure to asbestos*. Br. J. Cancer. 83: 104–111 (2000).

[236] Pan et al., *Residential proximity to naturally occurring asbestos and mesothelioma in California,* Am. J. Respir. Crit. Care Med. 172:1019–1025 (2005).

occupational exposures, these researchers reported an apparent direct correlation between the risk of mesothelioma and proximity of residence according to the distribution of asbestos-containing rocks in the general environment (mainly chrysotile, with some other forms of asbestos including tremolite). These authors found about a 6% reduction in the odds of mesothelioma for residence for every 10 km further away from the asbestos-containing rocks.

135. In the article by Hodgson et al. (2000), there is extrapolation information with regards to crocidolite that at cumulative exposure levels of only 0.01 f/ml-yrs, there are 20 deaths per 100,000 exposed with the highest arguable estimate 100 and the lowest 2 cases. Even at the lowest estimate of 2 cases per 100,000 exposed, this would be in excess of 20 times the figure commonly used as an assumed level of background or spontaneous mesothelioma development, which is approximately 1–2 cases per million people per year.[237] With respect to amosite, at a level of cumulative exposure of 0.01

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[237] One should note that this is an assumed level used to allow a standard for comparison. While it is commonly used as a comparison point, as discussed above, several significant papers have failed to find evidence to support any measurable "background" incidence of mesothelioma. Strauchen, *Rarity of Malignant Mesothelioma Prior to the Widespread Commercial Introduction of Asbestos: The Mount Sinai Autopsy Experience* 1883 — 1910, Am, J. lndustr. Med. 1–3 (201l); Mark et al., *Absence of Evidence for a Significant Background Incidence of Diffuse. Malignant Mesothelioma Apart from Asbestos Exposure*. Ann. N.Y. Acad. Sci. 643:196 – 204 (1991).

f/ml-yrs, the estimate is 3 deaths per 100,000 exposed, with the highest arguable estimate 20 and the lowest insignificant. For chrysotile, the risk for development of mesothelioma at 0.01 f/ml-yrs was stated to be probably insignificant, although the highest arguable estimate was 1 death per 100,000 exposed, which would still be 10 times that of the assumed background rate of 1 case per 1,000,000. The authors stated: "Taking this evidence together, we do not believe there is a good case for assuming any threshold for mesothelioma risk."[238]

136. The consensus is that medical science has yet to identify a threshold or minimum amount of asbestos exposure required to cause mesothelioma.[239]

137. An update by Hodgson and Darnton in 2009 concerning mesothelioma risk from chrysotile asbestos stated that, when information from a

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[238] Hodgson, J.T. and Darnton, A. *The quantitative risk of mesothelioma and lung cancer in relation to asbestos exposure*. Ann. Occup. Hyg.; 44:565–601; specifically, Table 11, page 585 (2000).

[239] Wiggins, Statement on malignant mesothelioma in the United Kingdom, 56 Thorax 250,252 (2001) ("[t]here is no evidence for a threshold dose of asbestos below which there is no risk" of mesothelioma); World Health Org'n, Environmental Health Criteria 203: Chrysolite Asbestos, 144 (1998) ("No threshold has been identified for-carcinogenic risks."). In fact, attempts to deduce such a threshold for mesothelioma have been dismissed as "logical nonsense." *See* John T. Hodgson & Andrew Darnton, *The Qualitative Risks of Mesothelioma and Lung Cancer in Relation to Asbestos Exposure*. 44 Ann. Occup. Hyg. 565, 583 (2000).

number of recent, well-conducted studies was incorporated into their mathematical model, the risk of mesothelioma caused by chrysotile derived from these data increased by a factor of 10 over the estimate from their earlier meta-analysis. The authors stated these new results strengthened the case for the proposition that the per fibre risk of mesothelioma from chrysotile textile plants was greater than it was in the mines. Whether this applied to other settings of chrysotile was stated to not be clear.[240] What is abundantly clear is that these estimates are susceptible to vast sways in magnitude depending upon the data included. Significantly, Hodgson & Darnton's recalculation likely still underestimates the potency of chrysotile because they failed to include numerous chrysotile-induced mesotheliomas from the Connecticut chrysotile cohorts.[241] Inclusion of these cases of chrysotile-induced mesotheliomas in Hodgson & Darnton's model would obviously diminish the magnitude of potency differences substantially.

138. In an abstract presented at the International Mesothelioma Interest Group Meeting, Rolland et al. evaluated the risk of pleural mesothelioma in a French population-based case-control study

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240 Hodgson, J.T. and Darnton, A., *Mesothelioma risk from chrysotile*. Occup. Environ. Med. (2009).

241 Finkelstein, M. et al, *Mesothelioma among employees of a Connecticut factory that manufactured friction materials using chrysotile asbestos*. Ann. Occup. Hyg. 54:692–696 (2010) (reporting on several mesothelioma cases originally published by Egilman).

between 1998 and 2002. The authors studied 19 French districts within the National Mesothelioma Surveillance Program covering 25% of the French population. The report was based on 467 confirmed cases (80% males, 41–93 years old) and 868 controls matched for sex, age and district. The authors found that among men, the highest risk was observed for the occupations of plumbers, pipefitters, sheet metal workers, and for the industries of ship repair, asbestos products, metal products and construction. The authors stated a significant dose-response relationship was found between cumulative occupational asbestos exposure and pleural mesothelioma, even for the lowest category (greater than 0-0.07 fibers/ml year; odds ratio 2.8, 95%; CI 1.7-4.7).[242]

139. Indeed, the expert *consensus* is that there is no safe level of exposure to asbestos and that all levels of exposure carry with them some risk of cancer. None of the major scientific bodies that have studied asbestos and mesothelioma have been able to identify a level of asbestos exposure below which mesothelioma will not occur. *See* World Health Organization: "No threshold has been identified for the carcinogenic risk of chrysotile";[243] National Cancer Institute Fact

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[242] Rolland, P. et al, *Risk of pleural mesothelioma: A French population-based case control study [1998–2002]*. Cancer, 54: Suppl IS9, abstract 35 (2006).

[243] World Health Organization. Elimination of asbestos-related diseases. Geneva, Switzerland: World Health Organization; Report No.: WHO/SDE/OEH/6.03 (2006).

Sheet, *Asbestos Exposure and Cancer Risk* ("the overall evidence suggests there is no safe level of asbestos exposure")[244]; the British Thoracic Society concludes that "a history of occupational asbestos exposure can be obtained in about 90% of cases in the U.K." and there is "no evidence for a threshold dose of asbestos below which there is no risk."[245] A recent study examining the relationship between historical asbestos use and disease rates further supports the conclusion that a linear dose-response relationship exists between exposure to asbestos and disease even at low doses.[246] In fact, the Occupational Health and Safety Administration (OSHA) determined that even at the lowest level of asbestos exposure at which OSHA found it feasible to set a standard in the workplace, 0.1 f/cc, there is significant risk of mesothelioma.[247]

140 Several agencies have commented that there is no safe level of exposure to asbestos:

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[244] National Cancer Institute. Factsheet - Asbestos: Questions and Answers. Bethesda MD, National Institutes of Health. Ref Type: Pamphlet (2003).

[245] British Thoracic Society, Statement on malignant mesothelioma in the United Kingdom, Thorax, 56(4):250–65 (2001).

[246] Lin, RT. et al., *Ecological association between asbestos-related diseases and historical asbestos consumption: an international analysis*. Lancet. 369(9564):844-9 (Mar. 10, 2007).

[247] Occupational Safety and Health Administration. Occupational exposure to asbestos; final rule. Federal Register; 59:40964-1162(1994).

a. NIOSH, 1976 (page 92): "excessive cancer risks have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or a 'safe' level of asbestos exposure."

b. NIOSH, 1980 (page 3): "All levels of asbestos exposure studied to date have demonstrated asbestos related disease...there is no level of exposure below which clinical effects do not occur."

c. USPHS, 1980: "it is important to point out that when a permissible level for exposure (PEL) to a certain carcinogen is set by OSHA, there is no implication that such a level is safe. To the contrary, it is the agency's policy that any occupational exposure to a carcinogen carries with it some risk of disease, even if it cannot be easily or precisely measured."

d. NIOSH, 1986 (page 319): "a linear, no threshold, dose-response relationship . . . Any asbestos exposure carries with it some increased risk of asbestos related disease."

e. OSHA, 1994 (page 40978): "reducing exposure to 0.1 f/cc would further reduce, but not eliminate, significant risk. The 0.1 f/cc level leaves a remaining significant risk."

f. WHO, 1998 (page 144): "Exposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer and mesothelioma in a dose-dependent manner. No threshold has been identified for carcinogenic risks."

g. WTO, 2000: "the experts confirm the position of the European Communities according to which it has not been possible to identify any threshold below which exposure to chrysotile would have no effect. The experts also agree that the linear relationship model, which does not identify any minimum exposure threshold, is appropriate for assessing the existence of a risk. We find therefore that no minimum threshold level of exposure or duration of exposure has been identified with regard to the risk of pathologies associated with chrysotile, except for asbestosis."

141. The introduction of *any* source of asbestos, above the trace background amounts, into the environment has been shown to create a significant increase in the risk of mesothelioma. For example, a recent article examining the incidence of mesothelioma in six Egyptian neighborhoods surrounding a plant that used chrysotile asbestos found 83 cases representing a "26-fold excess risk of pleural mesothelioma due to environmental exposure."[248] The levels of asbestos in these neighborhoods was very low — 1.7 of the mesothelioma cases occurred in a neighborhood a half a mile away from the plant where airborne asbestos the dust was measured at 0.04 f/cc. An additional 27 mesothelioma cases occurred in neighborhoods between 1 and 2.5 kilometers away with a dust measurement of

[248] Madkour et al., *Environmental exposure to asbestos and the exposure-response relationship with mesothelioma.* East Mediterr. Health J. 15(1): 25–38 (Jan 2009).

0.025 f/cc or less. Other studies have shown similar risks. Azuma[249] compared mesothelioma rates and environmental exposure levels at different periods in Japan and predicted that the "cumulative number of deaths from mesothelioma due to environmental asbestos exposure would be around 13,000–30,000 by 2039"; a study by Pan supported the hypothesis that residential proximity to naturally occurring deposits of asbestos in California is significantly associated with an increased risk of mesothelioma.[250] The United States Environmental Protection Agency has noted that, because of the nature of asbestos and its interaction in the human body, each exposure increases the likelihood of developing an asbestos-related disease.[251]

142. Attempts to postulate thresholds or safe levels for exposure to asbestos have been dismissed as "logical nonsense."[252] The lack of a defined "safe level for exposure to asbestos is supported by

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[249] Azuma et al., *Mesothelioma risk and environmental exposure to asbestos: past and future trends in Japan*. Intl. J. Occup. Environ. Health.; 15(2): 166–72 (Apr 2009).

[250] Pan et al., *Residential Proximity to Naturally Occurring Asbestos and Mesothelioma Risk in California*. Am. J. Respir. Crit. Care Med. (2004); 172:1019–25 (2005).

[251] Environmental Protection Agency. A Guide for Ship Scrappers; Tips for Regulatory Compliance. Environmental Protection Agency; Report No.: 315-13-.00-001 (2000).

[252] Hodgson et al., *The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure*. Ann. Occup. Hyg. 44(8):565–601 (Dec 2000).

research, including both epidemiology and medical journal reports. For example, a large French study recently concluded that substantial excess mortality occurs at exposure levels below current regulatory levels.[253] The National Research Council Committee on Non-Occupational Health Risks of Asbestiform Fibers found background environmental exposure of 0.0004 f/cc over a 73 year lifetime (which results in a cumulative dose of 0.03 f/cc-y) was associated with 9 cases of mesothelioma per million. A "higher" exposure of 0.002 fibers/cc (which results in a cumulative dose of 0.146 f/cc-y) was associated with 46 cases of mesothelioma per million — a five-fold risk[254]. A recent study examining the relationship between historical asbestos use and disease rates further supports the conclusion that a linear dose-response

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[253] Iwatsubo et al., *Pleural mesothelioma: dose-response relation at low levels of asbestos exposure in a French population-based case-control study*. Am. J. Epidem. 148(2):133–42 (Jul 15 1998). Indeed, Iwatsubo et al. (1998) found that attempts to quantify the minimum dose of asbestos that will result in mesothelioma through epidemiology have demonstrated that [a] significant excess of mesothelioma was observed far below the limits adopted in most industrial countries during the 1980s."; Rödelsperger et al. *Asbestos and man-made vitreous fibers as risk factors for diffuse malignant mesothelioma: results from a German hospital-based case-control study*. Am. J. Ind. Med.; 39(3):262–75 (Mar 2001).

[254] Asbestiform Fibers Nonoccupational Health Risks, Committee on Non-Occupational Health Risks of Asbestiform Fibers, Board on Toxicology and Environmental Health Hazards, Commission on Life Sciences, National Research Council, National Academy Press, Washington, D.C. (1984).

relationship exists between exposure to asbestos and disease and that no "safe" level of exposure exists.[255]

143. Expert consensus is that studies have shown that any identified occupational, domestic, or environmental exposure to asbestos increase the risk of mesothelioma.[256]

144. In determining cause and effect, physicians and scientific researchers typically look at two

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[255] Lin, R.T. et al., *Ecological association between asbestos.-related diseases and historical asbestos consumption: cm international analysis*. Lancet. 369(9564):844-9 (Mar 10 2007).

[256] Pan et al., *Residential Proximity to Naturally Occurring Asbestos and Mesothelioma Risk in California*. Am. J. Respir. Crit. Care Med. (2004); 172:1019-25 (2005); Iwatsubo et al., *Pleural Mesothelioma: dose-response relation at low levels of asbestos exposure in a French population-based case-control study*. Am. J. Epidem. 148(2):133–42 (Jul. 15, 1998); Rödelsperger et al., *Asbestos and man-made vitreous fillers. as risk factors for diffuse malignant mesothelioma: results from a German hospital-based case-control study*. Am. J. Ind, Med.; 39(3):262–75 (Mar 2001); Skarnmetitz et al., *Asbestos Exposure and Survival in Malignant Mesothelioma; A. Description of 122 Consecutive Cases at an Occupational Clinic.* 2(4) J. Occup. & Environ. Med. 228, 228–29 (Oct. 2011) (noting that for some patients the total asbestos exposure was "a few days"); Newhouse et al,, *Mesothelioma of Pleura and Peritoneum Following Exposure to Asbestos in the London Area.* 22(4) Br. J. Ind. Med, 261, 261–66 (1965) (two cases with 2 months or less exposure to asbestos); Borow et al., *Critical Review, Mesothelioma following Exposure to Asbestos: review of 72 Cases.* 64(5) Chest J. 641 (1973); Greenberg & Davies, supra note 2; Workplace Exposure to Asbestos: Review and Recommendations (DHHS (NIOSH) pub. no. 81-103, Apr. 1980) ("Studies of duration of exposure suggest that even at very short exposure periods (1 day to 3 months) significant disease can occur").

distinct issues, general causation and specific causation. General causation focuses on the issue of whether a particular substance is capable of causing a particular injury or condition in the general population. Specific causation, on the other hand, addresses the issue of whether an exposure to a substance or substances has caused or contributed to the development of a particular individual's injury or disease. To determine general causation, researchers evaluate a variety of data sets including animal studies, toxicology studies, human cellular toxicology studies, molecular studies, case reports, epidemiologic case-control and cohort studies and general biologic principles. If a review of these data sets establishes that there is a general cause and effect relationship, physicians then determine specific causation by ascertaining whether an exposure caused or contributed to a particular individual's disease.

145. As an overall model for determining causality, the considerations espoused by Sir Austin Bradford Hill are well accepted and have been widely used by epidemiologists and scientists of other disciplines.[257] They are: temporality, biologic gradient (dose-response), consistency, biologic plausibility, strength of association, analogy, experimental evidence, coherence and specificity. The scope of medical evidence that substantiate these considerations is both comprehensive and widely inclusive of all the

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[257] Hill, *The Environment and disease: association or causation?* 58(5) Proc. Royal Soc. Med, 295, 299 (1965).

available data. The empirical support for the considerations over such a large epistemological landscape represents, in itself, the ultimate merit of the considerations. The Hill Criteria are generally accepted but Hill himself recognized that no one factor was dispositive and that all the evidence matters, nor did all need to be met.

146. The fact that any one consideration or piece of scientific evidence can always be subject to criticism reinforces the need for consideration of all forms of scientific evidence. As Hill noted, "None of my nine view points can bring indisputable evidence for or against the cause-and-effect hypothesis, and none can be required as a *sine qua non*." Before applying this framework to the issue of whether exposure to chrysotile asbestos causes or contributes to cause mesothelioma, it is important to reflect upon the relative significance of each of these considerations in making such a determination. None of Hill's considerations require statistical epidemiologic data in the sense that that term is used to describe statistical analysis to the exclusion of observational epidemiology.

147. Lemen (2004), using the Bradford Hill considerations, reviewed the evidence for chrysotile's ability to cause mesothelioma and concluded that chrysotile exposure increased the risk of mesothelioma in humans.[258] IARC's most recent review also concludes, using the Bradford

[258] Lemon, *Chrysotile Asbestos as a Cause of Mesothelioma: Application of the Hill Causation Model*. Int. J. Occup. Environ. Health. 10:233–239 (2004).

Hill considerations, that chrysotile is a cause of pleural and peritoneal mesothelioma, lung cancer and asbestosis, among other diseases.[259] When it comes to looking at cause and effect through epidemiology, IARC noted important limitations:

> When several epidemiological studies show little or no indication of an association between an exposure and cancer, a judgment may be made that, in the aggregate, they show evidence of lack of carcinogenicity. Such a judgment requires first that the studies meet, to a sufficient degree, the standards of design and analysis described above. Specifically, the possibility that bias, confounding or misclassification of exposure or outcome could explain the observed results should be considered and excluded with reasonable certainty. In addition, all studies that are judged to be methodologically sound should (a) be consistent with an estimate of effect of unity for any observed level of exposure, (b) when considered together, provide a pooled estimate of relative risk that is at or near to unity, and (c) have a narrow confidence interval, due to sufficient population size. Moreover, no individual study nor the pooled results of all the studies should show any consistent tendency that the relative risk of cancer increases with increasing level of

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[259] IARC. Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

exposure. It is important to note that evidence of lack of carcinogenicity obtained from several epidemiological studies can apply only to the type(s) of cancer studied, to the dose levels reported, and to the intervals between first exposure and disease onset observed in these studies. Experience with human cancer indicates that the period from first exposure to the development of clinical cancer is sometimes longer than 20 years; latent periods substantially shorter than 30 years cannot provide evidence for lack of carcinogenicity.[260]

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149. "Strength of association" is a reflection of the power of a study. Human epidemiologic studies are not the only source of information type of data available to access this consideration. This consideration can be determined from human,

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[260] IARC, Monograph 100C: Asbestos (Chrysotile, Arnosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012) at page 22.

animal or microbiologic studies. The relevance of this consideration is limited by the prevalence of co-factors that may interfere with the measurement of the factor, that is being studied. Strength of association is not a measure of the importance of a particular factor in causation.[261] It is a gauge of potential errors due to confounding or bias. Studies with large rate ratios are less likely to contain errors attributable to bias or confounding. Causal factors with "relatively low rate ratios" may be equally or more important than strong associations from a public health perspective. In addition, a rate ratio of two is not required to establish that a factor contributed to a disease in a particular individual (specific causation). For example, chronic smoking of less than a pack a day induces less than a two fold increase in the risk of heart disease. Nonetheless, it is a universal opinion of physicians that smoking contributes to a smoker's heart disease if he/she smoked at this rate. In fact smoking is a contributing cause of death for about 400,000 people annually but "only" contributes to fewer than 100,000 cases of lung cancer each year. The same is true of second-hand or environmental tobacco smoke. The consensus of the medical community is that second-hand smoke causes cancer and other diseases notwithstanding the fact that the pooled risk estimate of the risk of lung cancer caused by

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[261] Rothman, K.J. Causal Inference — Lanes, S.F.: Error and uncertainty in causal inference. In Causal Inference, pp. 182–183.

second hand smoke is approximately 1.3.[262] Most elevations of blood cholesterol that require medical treatment do not double the risk of heart disease. Furthermore, physicians, when treating a patient for a heart attack, will indicate that previous smoking of a half pack of cigarettes per day for 30 years, family history of heart disease (nongenetic), history of elevated cholesterol of 250 mg/di are all contributing causes of their patient's heart attack. Considered by themselves, none of these factors have an elevated rate ratio greater than two. Epidemiological studies can, when evaluated together, provide more confidence in an association even in the absence of a "statistically significant" finding from any individual study. Greenland states,

> *... lack of 'statistical significance' is not evidence of a lack of hazard . . . a claim by an expert that 'statistical significance' or 'nonsignificance' demonstrates presence or absence of causation should serve as a warning to the court that said expert is*

[262] U.S. Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, (2006) (Surgeon General finding that a 20–30% increase in risk was sufficient to infer causation of lung cancer from secondhand tobacco smoke at p. 445).

> *incompetent in the use of statistics for causal inference.*[263]

150. Consider, for example, five different political polls that indicate that one of the candidates for office is ahead by between two and three points, a finding that is within the "sampling error" of each individual poll (non-statistically significant in each individual poll). It may be reasonable to conclude that the candidate was going to win on a more likely than not basis, since there are other types of statistical analysis that may allow for such conclusions.

151. Recent epidemiologic studies have showed strong associations between chrysotile asbestos and mesothelioma. [264]

152. After delineating each of his nine points, Hill's final emphasis placed responsibility on scientists for making causal judgments without blind (in fact without any) reliance on "statistical tests."

153. Hill explained his consideration as follows:

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[263] *See* Declaration of Professor Sander Greenland, taken on June 11, 2001.

[264] *E.g.*, Elliott et al., *Lung cancer mortality in North Carolina and South Carolina chrysotile asbestos textile workers*. Occup. Environ. Med. dol:10.1136 (2012); Loomis et al., *Lung cancer mortality and fiber exposures among North Carolina asbestos textile workers*. Occup. Environ. Med. 66:535–542 (2009); Mirabelli et al., *Excess of mesotheliomas utter exposure to chrysotile in Balangero, Italy*. Occup, Environ. Med. 65:815–819 (2008); Memo et al., *Mortality experience, in an historical cohort of chrysotile asbestos textile workers*. WS-E-03, Paper presented at the Global Asbestos Congress, Waseda University, Tokyo, Japan, November 19–21, 2004.

What they [Hill's nine points] *can do, with greater or less strength, is to help us to make up our minds on the fundamental question- is there any other way of explaining the set of facts before us, is there any other answer equally, or more, likely than cause and eject?* ***No formal tests of significance can answer those questions****. Such tests can, and should, remind us of the effects that the play of chance can create, and they will instruct us in the likely magnitude of these effects. Beyond that they contribute nothing to the proof of our hypothesis....The question that I had to answer, by the use of the National Health Insurance records of that lime* [1930] *was this: Do the workers in the cardroom of the spinning mill, who tend the machines that clean the raw cotton, have a sickness experience in any way different from that of other operatives in the same mills who are relatively unexposed to the dust and fibre that were features of the cardroom? The answer was an unqualified 'Yes.' From age 30 to age 60 the cardroom workers suffered over three times as much from respiratory causes of illness whereas from non-respiratory causes their experience was not different from that of the other workers, This pronounced difference with the respiratory causes was derived not from abnormally long periods of sickness but rather from an excessive number of repeated absences from work of the cardroom workers.*

All this has rightly passed into the limbo of forgotten things. What interests me today is this: My results were set out for men and women separately and for half a dozen age groups in 36 *tables. So there were plenty of sums. Yet I cannot find that anywhere I thought it necessary to use a test of significance. The evidence was so clear-cut, the differences between the groups were mainly so large, the contrast between respiratory and non-respiratory causes of illness .so specific, that no formal tests could really contribute anything of value to the argument. So why use them?*

...some editors of journals will return an article because tests of significance have not been applied. Yet there are innumerable situations in which they are totally unnecessary- because the difference is grotesquely obvious….

Of course I exaggerate. Yet too often I suspect we waste a deal of time, we grasp the shadow and lose the substance. We weaken our capacity 10 interpret data and to take reasonable decisions whatever the value of P. And far too often we deduce no difference' from 'no significant difference.' Like fire, the chi square test is an excellent servant and a had master.[265]

Not every question of causation needs an epidemiological study.

154. Hill recognized that decisions have to be made in the absence of perfect data: "All scientific work is incomplete—whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the

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[265] Hill, Bradford. *The Environment and disease: association or causation?* 58(5) Proc. Royal Soc'y Med. 295, 299–300 (1965) (bold and italics added).

knowledge we already have, or to postpone the action that it appears to demand at a given time."[266]

155. It is in this context that the mainstream scientific community has reviewed the literature on asbestos and concluded that asbestos from any source is a cause of mesothelioma in someone with cumulative exposure beyond that of the background exposures sustained by all.[267] "No exposure to asbestos is without risk."[268] Cumulative dose best explains the increased risk of mesothelioma in the population.[269]

156. It is precisely because we understand the limitations of epidemiology and how certain

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[266] Hill, Bradford. *The Environment and disease: association or causation?* 58(5) Proc. Royal Soc'y Med. 295, 299–300 (1965) at page 12.

[267] In this regard, all identifiable exposures of an individual are beyond "background" as a matter of simple logic as they are in excess of the background exposures of that individual: It is a logical impossibility to measure the risk created by "background" exposures sustained by all individuals as there is no unexposed comparison group against which to measure the rate of disease. Put another way, it is fallacious to say that "background" exposures to asbestos arc free from danger the risk of such exposures simply cannot be measured on a population basis.

[268] LaDou et al., *The Case for a Global Ban on Asbestos*. Environ. Health Perspectives 118:7 (July, 2010).

[269] 2 Dail & Hammar's Pulmonary Pathology 587 (Joseph F. Tomashefski, Jr. el al, eds., 3d ed. 2008) ("[W]hen there are multiple asbestos exposures, each contributes to cumulative exposure and, hence, to the risk and causation of MM [malignant mesothelioma]."); Bignon et al., *History and Experience of mesothelioma in Europe*. Mesothelioma 36 (Bruce W. Robinson & Phillippe Chahinian eds., 2002).

factors can bias studies toward a lack of statistical significance or finding of a point estimate of no increased risk that we look at the epidemiology of a substance along with the other scientific data described above. Each epidemiological study must be evaluated for its strengths and weaknesses and decisions about cause and effect should only be made on reliable data.

157. It is specifically because the epidemiological and all of the other scientific evidence that chrysotile asbestos causes mesothelioma is so strong that the mainstream scientific community has concluded and I am able to conclude that a mesothelioma in a patient exposed to dust from chrysotile asbestos brakes or clutches (or any other source of chrysotile asbestos) was caused, in whole or in part, by that dust.

158. Until recently, there were no epidemiological studies of people exposed primarily to asbestos from brakes reporting a statistically significant increased risk for mesothelioma, but that was likely a reflection of the fact that few studies were designed to detect such a risk. The collection of poorly done studies had led some industry-funded scientists to conclude that asbestos from brakes is somehow without risk for mesothelioma.[270] As explained by Freeman, et al. (2012), the industry scientists violated the maxim that lack of evidence of causation is not the same as evidence

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[270] Goodman et al. *Mesothelioma and lung cancer among motor vehicle mechanics: a meta-analysis*. Ann. Occup. 48(4):309–26 (2004).

of lack of causation."[271] Freeman critically analyzed the industry position and explained the fallacy of relying upon poorly designed, underpowered analyses to reject causation:

> From this analysis we determined that a minimum sample of 845 cases (assuming one non-frequency matched control for each case) would be required to identify an OR=2.0 with 1—b=0.80 (power) and a=0.05. Even if all of the cases in the Goodman et al. review could be pooled, this would only account for 9.3% of the necessary cases for an adequate study of the influence of occupation in the entire automotive repair industry on the risk of mesothelioma. It is important to note that in relying on the data produced by Paustenbach et al. in their industry sponsored publications, we likely relied on an underestimated number of study subjects needed to accomplish the study goals set forth by Goodman et al. The methods used to detect fiber levels in the air underlying the data reported by Paustenbach et al. systematically miss the shorter (<5 microns in length) fibers that are commonly found in chrysotile containing brake dust samples, and thus underreport the sampled chrysotile fiber levels.
>
> It is reasonable to conclude that the "net" of evidence supporting a causal nexus between brake dust exposure and mesothelioma favors

[271] Freeman et al., *Assessing specific causation of mesothelioma following exposure to chrysotile asbestos containing brake dust*. Int. J. Occup. Envir. Health 18:4 (2012).

causation, and that the weak "strands" indicated by industry scientists as evidence to the contrary either do not exist or are greatly outweighed by the evidence to the contrary.

Thus, the industry scientists ignore the mainstream requirement, as discussed by IARC[272] and others,[273] that "negative" epidemiology should only he relied upon where the studies were adequately powered to detect elevated risk.

159. Roelofs et al. (2013) reported a statistically significant increased risk (Standardized Morbidity Odds Ratio (SMOR) = 2.1 (95% CI = 1.1 – 4.0)) of mesothelioma for "automobile mechanics."[274] People working in "automotive repair and related services" also had statistically significant increased risk of 2.2 (95% CI = 1.2 – 3.9). When considered with all the evidence that asbestos causes human mesothelioma, this study is simply further confirmation of the mainstream position that asbestos from any source can cause mesothelioma in those exposed. While these data are accurate, other potential sources of asbestos

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[272] IARC, Monograph 100C: Asbestos (Chrysotile, Amosite, Crocidolite, Actinolite And Anthophyllite), Lyon: International Agency for Research on Cancer (2012).

[273] Welch et al., Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme Court. Int. J. Occup. Environ. Health. 13:318–327 (2007).

[274] Roelofs et al., *Mesothelioma and Employment in Massachusetts: Analysis of Cancer Registry Data 1988–2003*. Am. J. Indus. Med. (Epub ahead of print 2013).

may be unknown. These finding are consistent with the findings of Welch, et al. (2007).

160. Recently the British Health and Safety Executive (HSE) supported a relatively large epidemiological study of mesothelioma risk in Great Britain. Peto et al. (2010)[275] found that motor mechanics born between 1925 and 1930 and exposed before 30 years of age had a statistically significant increased risk of mesothelioma (Odds Ratio of 26.3, 95% Cl 2.1 — 259.9)). These motor mechanics had the highest risk of any of the "low risk industrial" groups of that age.

161. Because many occupations, including mechanics, are exposed to the only practical known cause of mesothelioma, asbestos, it is no wonder the mainstream scientific and medical community concludes "auto brake mechanics are known to be especially at risk of developing asbestos-related diseases."[276]

162 Scientists do not require epidemiological studies of every job category or every product to conclude that the toxic ingredient caused a signature injury of that toxin.[277] As Dr. Selikoff properly

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[275] Peto et al., *Occupational, domestic and environmental mesothelioma risks in Britain — A case-control study*. RR696 (2009).

[276] Ontario Ministry of Labour, Alert: Asbestos Hazard in Vehicle Brake Repair. (Issued April 10, 2013).

[277] Lemen, Asbestos: Risk Assessment, Epidemiology, and Health Effects. Chapter 5 *Epidemiology of Asbestos-Related Diseases and the Knowledge. that Led to What is Known Today*, Boca Raton: Taylor and Francis (2011) at page 170.

stated, "[t]he floating fibers do not respect job classifications."[278] For example, scientists and physicians will have no trouble linking an individual lung cancer to cigarettes in a 5 year Marlboro smoker, even though there are no epidemiological studies of Marlboro-only smokers, even though we know that different cigarettes have different ingredients and even though that individual also smoked Winston, Pall Mall and or other brands at various other points in their life. Similarly, it's unlikely that a physician would think twice about attributing a poisoning death to arsenic in coffee even though there are no epidemiologic studies of people who ingested arsenic in coffee. Thus, even though there are no well-designed epidemiological studies of workers who worked with chrysotite asbestos joint compounds, or other such single exposures, the mainstream medical and scientific community would have no trouble attributing the patient's mesothelioma to this chrysotile exposure.

163. Due to the extensive and longstanding use of asbestos, the ambient air in the United States contains minute amounts of asbestos. These ambient air concentrations are generally known as the "background level." Per the ATSDR,

> For example, 10 fibers are typically present in a cubic meter (fibers/m3) of outdoor air in rural areas. (A cubic meter is about the amount of air that you breathe in 1 hour.)

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[278] Selikoff, I. et al., *Asbestos Exposure and Neoplasia*. JAMA 22–26 (1964).

Health professionals often report the number of fibers in a milliliter (mL) (equivalent to a cubic centimeter [cm^3]) of air rather than in a cubic meter of air. Since there are one million cm^3 (or one million ML) in a cubic typically would be 0.00001 fibers/mL, of asbestos in air in rural areas. Typical levels found in cities are about 10-fold higher.[279]

164. This "background level" of exposure to asbestos is very low when compared to occupational exposures. For example, if only OSHA fibers (*i.e.* fibers longer than 5 microns) are counted, an exposure at the current OSHA PEI., of 0.1 f/cc over a single eight (8) hour workday would mean a worker would breathe 384,000 fibers as compared to the person in a rural environment who would breathe about 29 fibers every eight (8) hours.[280] Put differently, one day at the current

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[279] U.S. Public Health Service, U.S. Department of Health & Human Services. *Public Health Statement Asbestos CAS#: 1332-21-4.* Atlanta Agency for Toxic Substances and Disease Registry (September 2001).

[280] The ambient air exposures were calculated based on the assumption that a person breathes 12 breaths/minute at rest, each breath is 500 cc of air, so the person breathes 6,000 cc/minute. Over eight hours, a resting person will breathe 2,880,000 cc of air (360,000 cc/hour x 8 hours), 2,880,000 x 0.00001 = 28.8 fibers for every 8 hours breathing ambient air. The OSHA PEL exposures were calculated based on the assumption that a person breathes 16 breaths/minute during moderate work, each breath is 500 cc of air, so the person breathes 8,000 cc/minute. The person would breathe 480,000 cc/hour. At 0.1 f/cc, this person would breath 800 fibers per minute or 48,000 per hour. Over eights hours, a working person will breathe cc of air (480,000 cc/hour x 8 hours) 3,840,000.

OSHA PEL is about 13,000 times the background over the same eight hour workday. It bears noting that someone working with asbestos will receive whatever exposures he/she gets from the sources of asbestos in addition to whatever exposure that person receives from the local "background." It is also important to recognize that for every OSHA fiber counted, there are many more fibers in a given air sample which are not counted under the NIOSH 7400 method.

165. In contrast to the ambient background, one asbestos company official explained the exposures experienced at the 1985 OSHA PEL of 2.0 f/cc:

> In physical terms 2.0 f/cc equals 2,000,000 fibers per cubic meter of air (f/m^3). Humans inhale about one cubic meter of air per hour, depending on the degree of activity. Thus, at this concentration a worker would inhale roughly 16,000,000 fiber 5 microns in length over an 8-hour day disregarding the possibility of an infinite number of shorter fibers being present under some conditions.[281]

166. With respect to background concentrations, it is my opinion that "background" is a vague term that has not been well defined. Regardless of the actual background experienced by any person,

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3,840,000 x 0.00001 = 384,000 fibers every 8 hours at the OSHA PEL of 0.1 f/cc.

[281] Young, B, Union Carbide Internal Correspondence *re Asbestos Exposure Effects. Potential of Non-Insulator Crafts* (June 28, 1985).

any inhalation of asbestos released from a point source would .be above background by definition.

167. In 1999, Hillerdal reported several cases of low level exposure to asbestos and the development of mesothelioma and concluded there might not be a true background rate at which mesothelioma occur.[282] Studies have confirmed that mesothelioma is a relatively new disease and appears to correlate with the rise in usage of asbestos.[283]

168. There much published evidence that neighborhood environmental asbestos exposures can be sufficient to cause mesothelioma. For example, in a study carried out in greater Cairo, Egypt concerning asbestos and the exposure-response relationship with mesothelioma, the study evaluated the prevalence of malignant pleural mesothelioma due to occupational and environmental (non-occupational) exposure to asbestos among persons who worked in the asbestos manufacturing plant and in persons living in an area nearby the plant. Eighty-eight cases of mesothelioma were diagnosed, 87 in the exposed group. The risk of mesothelioma was

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[282] Hillerdal G. *Mesothelioma: cases associated with non-occupational and low dose exposures*. Occup. Environ. Med, 1999;56:505–513.

[283] Mark et al., A*bsence of Evidence .for a Significant Background Incidence of Diffuse Malignant Mesothelioma Apart from Asbestos Exposure*. Ann. N.Y. Acad. Sci. 643:196–204 (1991); Strauchen, *Rarity of Malignant Mesothelioma Prior to the Widespread Commercial Introduction of Asbestos: The Mount Sinai Autopsy Experience*. 1883–1910. Am. J. Industr. Med. 1–3 (2011).

stated to be higher in the environmentally exposed group than in other groups and was higher in females than males. The prevalence of mesothelioma increased with increased cumulative exposure to asbestos.[284] Pan et al. found that residential proximity to naturally occurring asbestos showed an independent and dose-response association with mesothelioma risk.[285] Goldberg et al. stated: "there is a real burden of environmental asbestos exposure in industrialized countries that could account for approximately 20% of all mesotheliomas." However, further research was needed. Furthermore, the authors stated the high proportion of female mesothelioma cases with no identifiable asbestos exposure suggested that the burden of environmental asbestos exposure was far from negligible.[286] Therefore, based on the information available, all occupational and bystander exposures to asbestos above the background or ambient levels of asbestos within the latency period have the ability to contribute to the causation of mesothelioma.

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[284] Madkour et al., *Environmental exposure to asbestos-response relationship with mesothelioma.* Eastern Mediterranean Health J. 15:25–38 (2009).

[285] Pan, X.L. et al., *Residential proximity to naturally occurring asbestos and mesothelioma risk in California.* Am. J. Respir. Crit. Care Med. 2005; 172:1019–1025.

[286] Goldberg S, Rey G, Luce D et al., *Possible effect of environmental exposure to asbestos on geographical variation in mesothelioma rates.* Occup. Environ. Med. 2010;67:417–421.

169. I believe that there is a background/ambient level of asbestos exposure that exists in the environment and I do not believe that background/ambient levels of exposure can be proven to cause mesothelioma by the method of comparative epidemiology. This is because there is no unexposed control group. However, if a person sustains asbestos exposures above background/ambient levels of exposure and goes on to develop mesothelioma it is my opinion that all of the exposures above background are significant contributing causes in the development of the mesothelioma. Nevertheless, it is generally accepted in the scientific community that there is no known level of asbestos exposure which has been shown not to contribute to the development of mesothelioma.

170 While epidemiology can tell us what happens in a population of people with similar characteristics, it cannot tell us what happens within each individual within that population. Many environmental carcinogens only produce about 10% cancer in exposed individuals (*i.e.* cigarette smokers), which is similar for asbestos induced mesothelioma in the most heavily exposed population (*i.e.* insulators).[287] Various factors may affect this; one of the more important factors includes genetic or individual susceptibility.[288] Because of the nature of asbestos, the fact that

[287] Tomatis et al., *The role of asbestos fiber dimensions in the prevention of mesothelioma.* 13(1) Int'l J. Occup. Environ. Health. 64 (2007).

[288] *Id.*

epidemiology has detected an excess risk of mesothelioma at levels of exposure that can be reached in a few days of exposure, and that any occupational, para-occupational or domestic exposure to asbestos is by definition an exposure that is thousands of times greater than the minute levels of asbestos seen in the background ambient air, it is not necessary to quantify an occupational or Para-occupational exposure to asbestos before concluding that it caused or contributed to cause a mesothelioma.

171. In January of 1997, a group of 19 experts from 8 different countries met in Helsinki, Finland "to discuss disorders of the lung and pleura in association with asbestos and to agree upon state-of-the-art criteria for their diagnosis and attribution with respect to asbestos." These experts included pathologists, radiologists, occupational and pulmonary physicians, epidemiologists, toxicologists, industrial hygienists, and clinical and laboratory scientists specializing in tissue fiber analysis. Collectively, the group had "published over 1,000 articles on asbestos and associated disorders."[289]

172. In rendering criteria on the attribution of mesothelioma to asbestos exposure, the Consensus Panel considered the following generally accepted concepts regarding mesothelioma:

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[289] Consensus Report: Asbestos, asbestosis, and cancer: the Helsinki criteria for diagnosis and attribution, Scand. J. Work Environ. Health. 23:311-6 (1997) ("Consensus Report").

- The great majority of mesotheliomas are due to asbestos exposure.
- Mesothelioma can occur in cases with low asbestos exposure. However, very low background environmental exposures carry only an extremely low risk.
- About 80% of mesothelioma patients have had some occupational exposure to asbestos, and therefore a careful occupational and environmental history should be taken.
- An occupational history of brief or low-level exposure should he considered sufficient for mesothelioma to be designated as occupationally related.
- A minimum of 10 years from the first exposure is required to attribute the mesothelioma to asbestos exposure, though in most cases the latency interval is longer (e.g., on the order of 30 to 40 years).
- Smoking has no influence on the risk of mesothelioma.

Consensus Report, at p. 313. Relying on these medical facts, the Consensus Panel concluded that "all types of malignant mesothelioma can be induced by asbestos, with the amphiboles showing greater carcinogenic potency than chrysotile" and that "a history of significant occupational, domestic, or environmental exposure to asbestos will suffice for attribution." *Id.* Significantly, the Helsinki Criteria does not require a quantitative estimate of a patient's asbestos "dose" exceeding some undefined level in order to attribute mesothelioma to a given asbestos exposure. The Helsinki Consensus conclusion is that chrysotile asbestos causes mesothelioma.

173. Given the strong possibility that all mesotheliomas are related to asbestos exposure, it is no surprise that the Helsinki criteria stated: "very low background environmental exposures carry only an extremely low risk."[290] Low risk is not zero and any addition to the background exposure is significant.

174. As set forth in Welch et al. (2007), the mainstream approach to causation in individual is as follows:

> Examining the question of causation of disease in an individual generally involves four questions: 1) was the individual exposed to a toxic agent 2) does the agent cause the disease present in the individual; 3) was the individual exposed to this substance at a level where disease has occurred in other settings; and 4) have other competing explanations for the disease been excluded?
>
> There is no reasonable dispute regarding Question 2—asbestos causes mesothelioma. Additionally, there are no well-accepted competing explanations in North America regarding mesothelioma that must be excluded, resolving Question 4. As a result, when considering the issue of causation of a mesothelioma, once an occupational or para-

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290 Consensus Report, Asbestos, asbestosis and cancer: The Helsinki criteria for diagnosis and attribution. Scand. J. Work Environ. Health, 1997; 23:311–316.

occupational exposure to asbestos has been established (Question 1), the sole question remaining for examination is whether the exposure or set of exposures of that individual is similar to exposures that have been documented to cause mesothelioma in others — Question 3. The mainstream scientific community is in consensus regarding the resolution of Question 3. As discussed above, there is no safe level of exposure to asbestos. Even exposure at current regulatory levels results in excess mesotheliomas. Accordingly, the consensus of the scientific community is that any occupational or paraoccupational exposure to asbestos—even "brief or low-level exposures"—must be considered causal in an individual with a mesothelioma.[291]

175. I do not believe that exposure to a *single* asbestos fiber is at all likely to cause mesothelioma or any other asbestos related cancer. A single asbestos fiber will not cause non-malignant asbestos disease. I believe that every inhaled *fiber* contributes to the risk of developing mesothelioma. ***From a medical and scientific perspective, in a person with mesothelioma, it is my opinion that the cumulative exposure to asbestos contributes to the total dose of asbestos. The total cumulative exposure combines to cause the risk and ultimately, in someone with the disease, to***

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[291] Welch et al., Asbestos exposure causes mesothelioma, but not this asbestos exposure: an amicus brief to the Michigan Supreme Court. Int. J. Occult. Environ, Health. 13:318–327 (2007).

cause a patient's mesothelioma. These are my medical and scientific opinions. I am not offering legal opinions about whether an exposure is "significant" or "substantial" within the meaning of the law. I can only offer opinions about the *medical* and *scientific* significance of an exposure. It must be remembered that an "exposure" is never a single fiber; as discussed below, when someone breathes visible dust from an asbestos product, there millions or billions of asbestos fibers present.

176. Lung cancer and mesothelioma occur when asbestos fibers such as those described above cause genetic errors in epithelial cells lining the airways, or in mesothelial cells that form the lining of the pleural and peritoneal cavities. All the types of asbestos fibers, including chrysotile, have been shown to cause the chromosomal rearrangements and aneuploid condition that can lead to neoplastic transformation of epithelial and mesothelial cells. Asbestos damages DNA and causes cancers in both animal models and humans.

177. It is clear that multiple errors take place before cells are committed to developing cancerous clones. The damage to DNA may occur as soon as the fibers reach the target cells. In the case of mesothelioma, fibers that are transported to the pleura within hours or days after each exposure are taken up by the mesothelial cells and can rapidly cause genetic errors. If those errors are in genes that control cell growth, the door to the development of cancer has opened.

178. In an individual who has been diagnosed with a cancer, it is clear that multiple mesothelial cells have accumulated a series of genetic errors over years until one of those cells, with the required set of mutations for that individual, loses control of normal growth and grows out as a clone into a deadly malignant mesothelioma. Cells with genetic errors are routinely removed from the body by natural defense mechanisms, but it takes only one epithelial or mesothelial cell with sufficient errors to escape detection and form the clone that brings the individual to the clinic, usually two to six decades after the first asbestos exposure. Some mesotheliomas have been shown to develop quickly after asbestos exposures, most likely because of an increased susceptibility to developing genetic errors, or because of a reduced capacity to repair genetic damage, or, perhaps very high levels of exposure. Each exposure to asbestos contributes to the development of the disease process, be it lung scarring, lung cancer, or mesothelioma. A few cases of mesothelioma have been reported with less than ten years of latency.[292]

179. Asbestos exposure often involves extremely small fibers released and inhaled in large amounts. But these enormously large amounts look, on paper, deceptively small. Even at so-called "low" exposure rate — e.g., 0.01 .fibers per cubic centimeter (f/cc), ten times lower than the current OSHA permissible exposure limit (PEL) of 0.1 f/cc

[292] Selikoff and Lee, *Asbestos and Disease*. Academic Press p. 265 (1978).

— an unprotected person may inhale as many as 80 fibers per minute, 4,800 fibers per hour, 38,400 fibers per day, and 9,600,000 fibers in a 250 day working year. At the current OSHA PEI, of 0.1 flee, each of these numbers would be magnified by a factor of ten resulting in 800 fibers per minute, 48,000 fibers per hour, 384,000 fibers per day, and 96,000.000 fibers in a 250 day working year. And 0.1 f/cc is currently occupational permissible exposure in the United States. Furthermore, it is recognized by OSHA that exposures at a level of 0.1 f/cc-y, excess cancer deaths will occur.[293]

180. A seemingly tiny amount of asbestos is actually a large number of asbestos fibers.

181. As Lemen documents, what some people consider "low level exposures" actually involve surprisingly high numbers of fibers: "Studies conducted by General Motors researchers or brake wear debris demonstrate that 90,000 asbestos fibers per nag remain in that dust [Williams and Muhlbaier. 1980]. Fibers less than 5 min in length outnumber fibers greater than 5 mm in length by a ratio of 300:1. This translates to approximately 300 billion asbestos fibers greater than 5 mm per g of wear debris and 90 trillion asbestos fibers less than 5 mm."[294] In eases of pleural mesothelioma„ the predominant fiber found in the pleura is chrysotile fibers

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[293] *See* Federal Register, Vol. 51, No. 119, June 20, 1986, Table 6, p. 22644.

[294] Lemen, *Asbestos in brakes; exposure and risk of disease*. Am. J. Ind. Med. 45(3):229–237 (2004).

shorter than 5 microns.[295] Numerous studies have demonstrated that mechanics that worked with asbestos-containing brakes without dust control measures were exposed to asbestos dust at levels thousands of times higher than what is seen in the ambient air — particularly when compressed air or dry brushing is used to clean out the wear dust from old asbestos brakes.[296] In addition, the EPA and OSHA and other regulatory agencies throughout the country have issued guidance documents to reduce the risk of disease from asbestos exposure during brake work.[297]

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[295] Suzuki et al., *Asbestos Fibers Contributing to the induction of Human Malignant Mesothelioma*. Ann. N.Y. Acad. Sci. 982:160–176 (2002).

[296] Sakai et al., *Asbestos Exposures During Reprocessing of Automobile Brakes and Clutches*. 12(2) Int. J. Occup. & Environ. Health 95,95–105 (2006); Lorimer et al, *Asbestos exposure of brake repair workers in the United States*. 43(3) Mt. Sinai J. Med. 207, 207–18 (1976); Rohl et al., *Asbestos Exposure During Brake Lining Maintenance and Repair*. 12 Environ. Res, 110, 110–28 (Aug, 1976); D.E. Hickish & K.L. Knight, *Exposure to Asbestos During Brake Maintenance*. 131(1) Ann. of Occup. Hyg. 1–7, 17–21(1970).

[297] *See e.g, Occupational Exposure to Asbestos*, supra note 7; Environmental Protection Agency ("EPA"), *Current Best Practices for Preventing Asbestos Exposure Among Brake and Clutch Repair Workers*, EPA 747-F-04-004 (Mar. 2007); OSHA, *Asbestos-Automotive Brake and Clutch Repair Work. 2006*; SHIB 07-26-2006; Wash. State Department of Labor & Indus., *Working Safely with Asbestos in Clutch and Brake Linings*. F41 3-049-000, Olympia WA, Wash, State Department- of Labor & Indus. (2001); N.H. Pollution Prevention Program, *Pitstops Manual: Best Management Practices for Automobile Service Facilities* (2001); Worksafe Alberta, *Control of asbestos during brake maintenance*

182. In determining the relative contribution of any exposures to asbestos above background levels, it is important to consider a number of factors, including: the nature of exposure, the level of exposure and the duration of exposure, whether a product gives off respirable asbestos fibers, the level of exposure, whether a person was close to or far from the source of fiber release, how frequently the exposure took place and how long the exposure lasted, whether engineering or other methods of dust control were in place, and whether respiratory protection was used.

183. I utilize a linear dose-response model for risk assessment that has been used by OSHA, NIOSH and other governmental entities for more than two decades, to reach my opinion that a patient's mesothelioma was caused by his/her total and cumulative exposure to asbestos. The linear dose-response model is a conservative model and some risk assessments show a supralinear dose response (*i.e.* there is a greater per unit risk at lower doses).[298] As discussed above, I rely upon the *methodology* of attribution espoused in the *Consensus Report, Asbestos, Asbestosis, and*

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and repair, Department of Human Res. & Empl. Gov't of Alberta (2004); Minn. Pollution Control Agency, *Facts About Controlling Brake Dust to Protect Your Health, What Every Mechanic Should Know (1998).*

[298] Berman et al, *Update of Potency Factors for Asbestos-Related Lung Cancer and Mesothelioma*, Crit. Rev. Toxicol. 38: (Suppl 1)1–47 (2008). These author recognized if the true exposure response for mesothelioma is supra linear, this would have important implications for efforts to estimate risk from low exposures," *Id.* at 13.

Cancer: The Helsinki criteria or diagnosis and attribution, commonly known as the "Helsinki Criteria", as applied to the factual evidence of a patient's exposures.[299]

184. It is my opinion that mesothelioma is a dose-response disease and that the resulting disease is the cumulative result of all of the exposures to asbestos that a person receives. The cumulative exposure that a mesothelioma patient has received in their lifetime has caused impact to the lungs, has overwhelmed the body's defense mechanisms, brought about genetic changes, and has caused mesothelioma or other cancers at whatever site it develops.

185. This process takes place as fibers inhaled into the lungs are transported to the pleura or other tissue and cause injury there, including injury to the mesothelial cells, regeneration of mesothelial cells, and genetic changes to mesothelial cells caused by interaction between the asbestos fibers and the chromosomes of those individual cells. Eventually in a person who develops a mesothelioma, there will be a conversion of one or more of those mesothelial cells to a malignant phenotype, which then eventually grows into a tumor that presents clinically as a mesothelioma.

186. The more asbestos fibers that are inhaled into the lung the more likely it is that more of them will

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[299] Consensus Report, Asbestos, Asbestosis, and Cancer: The Helsinki criteria for diagnosis and attribution, Scan J. Work Environ Health, 23:311-6 (1997). While I do not agree with every sentence of the Helsinki Criteria, I do agree with the approach to attribution of causation set forth therein.

be translocated to the pleura. Of course, some of the fibers inhaled may be removed by the mucociliary escalator, some fibers will be deposited in the alveolar spaces and some may be taken up by macrophages. Other fibers may work their way into the interstitium or make their way to the lymph nodes. But there are fibers from each exposure that make their way to the pleura, which is comprised of mesothelial cells — the target cells for mesothelioma. Additionally, asbestos fibers that do not reach the tumor site can and do release cytokines that affect cell division. Because cancer is, at its simplest definition, uncontrolled cell divisions, even asbestos fibers that do not reach the tumor site may play a role in causing cancer.

187. If a person is exposed to less asbestos fibers, then there will be fewer fibers that ultimately make their way to the pleura. Conversely, if a person is exposed to more asbestos fibers, there will be more fibers that make their way to the pleura. This is the nature of the dose-response relationship between asbestos exposure and mesothelioma; the more asbestos exposure a person has, the greater his/her chance of developing mesothelioma. In a person who develops mesothelioma, that disease is the result of the cumulative amount of asbestos and the risk of getting the disease increases with each exposure.

188. This affidavit represents a summary of my opinions based on my education.

189. , training, and experience and on the literature and documents cited. While I do not agree with every sentence of every document cited therein, these publications are authoritative for the propositions for which I cited them. Many of these articles, publications, and documents are cited by myself and other authors in published, peer-reviewed publications. I believe that these publications are generally reliable, although I may not agree with every sentence in a publication, and are of the type relied upon by legitimate experts in asbestos and asbestos-related disease.

/s/Arthur L. Frank

SWORN TO AND SUBSCRIBED

before me this 10th day of Dec. 2013

/s/Patricia A. Buck

NOTARY PUBLIC

My commission expires: June 22, 2015

(SEAL)

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JOHN B. DEVRIES, ET AL.,	:	CONSOLIDATED UNDER MDL 875
Plaintiffs,	:	
v.	:	
GENERAL ELECTRIC COMPANY, ET AL.,	:	E.D. PA CIVIL ACTION NO. 5:13-00474-ER
Defendants.	:	

O R D E R

AND NOW, this **1st day of October, 2014**, it is hereby **ORDERED** that the Motion for Summary Judgment of Defendant Warren Pumps (Doc. No. 263) is **GRANTED**.[1]

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[1] This case was removed in January of 2013 from the Court of Common Pleas of Philadelphia to the United States District Court for the Eastern District of Pennsylvania as part of MDL-875.

Plaintiff alleges that he was exposed to asbestos while serving in the U.S. Navy during the time period of 1957 to 1960. Plaintiff alleges that Defendant Warren Pumps ("Warren" or "Warren Pumps") manufactured pumps used aboard ships. The alleged

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asbestos exposure pertinent to Defendant Warren occurred while Plaintiff was aboard the following ship:

- *USS Turner*

Plaintiff asserts that he developed an asbestos-related illness as a result of his exposure to Defendant's asbestos-containing products.

Plaintiff brought claims against various defendants. Defendant Warren has moved for summary judgment, arguing that (1) there is insufficient evidence to establish causation with respect to its product(s), and (2) it is entitled to summary judgment on grounds of the bare metal defense.

The parties assert that maritime law applies.

II. Legal Standard

A. <u>Summary Judgment Standard</u>

Summary judgment is appropriate if there is no genuine dispute as to any material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(a). "A motion for summary judgment will not be defeated by 'the mere existence' of some disputed facts, but will be denied when there is a genuine issue of material fact." *Am. Eagle Outfitters v. Lyle & Scott Ltd.*, 584 F.3d 575, 581 (3d Cir. 2009) (quoting *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 247–248 (1986)). A fact is "material" if proof of its existence or non-existence might affect the outcome of the litigation, and a dispute is "genuine" if "the evidence is such that a reasonable jury could return a verdict for the nonmoving party." *Anderson*, 477 U.S. at 248.

In undertaking this analysis, the court views the facts in the light most favorable to the non-moving party. "After making all reasonable inferences in the nonmoving party's favor, there is a genuine issue of material fact if a reasonable jury could find for the nonmoving party." *Pignataro v. Port Auth. of N.Y. & N.J.*, 593 F.3d 265, 268 (3d Cir. 2010) (citing *Reliance Ins. Co. v. Moessner*, 121 F.3d 895, 900 (3d Cir. 1997)). While the moving party bears the initial burden of showing the absence of a genuine issue of material fact, meeting this obligation shifts the burden to the non-moving party who must "set forth specific facts showing that there is a genuine issue for trial." *Anderson*, 477 U.S. at 250.

B. The Applicable Law

The parties assert that maritime law applies. Whether maritime law is applicable is a threshold dispute that is a question of federal law, *see* U.S. Const. Art. III, § 2; 28 U.S.C. § 1333(1), and is therefore governed by the law of the circuit in which this MDL court sits. *See Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362 (E.D. Pa. 2009) (Robreno, J.). This court has previously set forth guidance on this issue. *See Conner v. Alfa Laval, Inc.*, 799 F. Supp. 2d 455 (E.D. Pa. 2011) (Robreno, J.).

In order for maritime law to apply, a plaintiff's exposure underlying a products liability claim must meet both a locality test and a connection test. *Id.* at 463–66 (discussing *Jerome B. Grubart, Inc. v. Great Lakes Dredge & Dock Co.*, 513 U.S. 527, 534 (1995)). The locality test requires that the tort occur on navigable waters or, for injuries suffered on land, that the injury be caused by a vessel on navigable waters. *Id.* In assessing whether work was on "navigable waters" (i.e., was sea-based) it is important to note that work performed aboard a ship that is docked at the shipyard is sea-based work, performed on navigable waters. *See Sisson v. Ruby*, 497 U.S. 358 (1990). This Court has previously clarified that this includes work aboard a ship that is in "dry dock." *See Deuber v. Asbestos Corp. Ltd.*, No. 10-78931, 2011 WL 6415339, at *l n.1 (E.D. Pa. Dec. 2, 2011) (Robreno, J.) (applying maritime law to ship in "dry dock" for overhaul). By contrast, work performed in other areas of the shipyard or on a dock, (such as work performed at a machine shop in the shipyard, for example, as was the case with the Willis plaintiff discussed in *Conner*) is land-based work. The connection test requires that the incident could have "'a potentially disruptive impact on maritime commerce,'" and that "'the general character' of the 'activity giving rise to the incident' shows a 'substantial relationship to traditional maritime activity.'" *Grubart*, 513 U.S. at 534 (citing *Sisson*, 497 U.S. at 364, 365, and n.2).

Locality Test

If a service member in the Navy performed some work at shipyards (on land) or docks (on land) as opposed to onboard a ship on navigable waters (which includes a ship docked at the shipyard, and includes those in "dry dock"), "the locality test is satisfied as long as some portion of the asbestos exposure occurred on a vessel on navigable waters." *Conner*, 799 F. Supp. 2d at 466; *Deuber*, 2011 WL 6415339, at *l n.1. If, however, the worker never

> sustained asbestos exposure onboard a vessel on navigable waters, then the locality test is not met and state law applies.
>
> Connection Test
>
> When a worker whose claims meet the locality test was primarily sea-based during the asbestos exposure, those claims will almost always meet the connection test necessary for the application of maritime law. *Conner*, 799 F. Supp. 2d at 467–69 (citing *Grubart*, 513 U.S. at 534). This is particularly true in cases in which the exposure has arisen as a result of work aboard Navy vessels, either by Navy personnel or shipyard workers. *See id*. But if the worker's exposure was primarily land-based, then, even if the claims could meet the locality test, they do not meet the connection test and state law (rather than maritime law) applies. *Id.*

The alleged exposures pertinent to Defendant occurred aboard a ship. Therefore, these exposures were during sea-based work. *See Conner*, 799 F. Supp. 2d 455; *Deuber*, 2011 WL 6415339, at *1 n.1. Accordingly, maritime law is applicable to Plaintiff's claims against Defendant. *See id.* at 462–63.

C. Bare Metal Defense Under Maritime Law

This Court has held that the so-called "bare metal defense" is recognized by maritime law, such that a manufacturer has no liability for harms caused by – and no duty to warn about hazards associated with – a product it did not manufacture or distribute. *Conner v. Alfa Laval, Inc.*, 842 F. Supp. 2d 791, 801 (E.D. Pa. 2012) (Robreno, J.).

D. Product Identification/Causation Under Maritime Law

In order to establish causation for an asbestos claim under maritime law, a plaintiff must show, for each defendant, that "(1) he was exposed to the defendant's product, and (2) the product was a substantial factor in causing the injury he suffered." *Lindstrom v. A-C Prod. Liab. Trust*, 424 F.3d 488, 492 (6th Cir. 2005); citing *Stark v. Armstrong World Indus., Inc.*, 21 F. App'x 371, 375 (6th Cir. 2001). This Court has also noted that, in light of its holding in *Conner*, 842 F. Supp. 2d 791, there is also a requirement (implicit in the test set forth in *Lindstrom* and *Stark*) that a plaintiff show that (3) the defendant manufactured or distributed the asbestos-containing product to which exposure is alleged. *Abbay v. Armstrong Int'l., Inc.*, No. 10-83248, 2012 WL 975837, at *l n.l (E.D. Pa. Feb. 29, 2012) (Robreno, J.).

Substantial factor causation is determined with respect to each defendant separately. *Stark*, 21 F. App'x. at 375. In establishing causation, a plaintiff may rely upon direct evidence (such as testimony of the plaintiff or decedent who experienced the exposure, co-worker testimony, or eye-witness testimony) or circumstantial evidence that will support an inference that there was exposure to the defendant's product for some length of time. *Id.* at 376 (quoting *Harbour v. Armstrong World Indus., Inc.*, No. 90-1414, 1991 WL 65201; at *4 (6th Cir. April 25, 1991)).

A mere "minimal exposure" to a defendant's product is insufficient to establish causation. *Lindstrom*, 424

F.3d at 492. "Likewise, a mere showing that defendant's product was present somewhere at plaintiff's place of work is insufficient." *Id.* Rather, the plaintiff must show "'a high enough level of exposure that an inference that the asbestos was a substantial factor in the injury is more than conjectural.'" *Id.* (quoting *Harbour*, 1991 WL 65201, at *4). The exposure must have been "actual" or "real", but the question of "substantiality" is one of degree normally best left to the fact-finder. *Redland Soccer Club. Inc. v. Dep't of Army of U.S.*, 55 F.3d 827, 851 (3d Cir. 1995). "Total failure to show that the defect caused or contributed to the accident will foreclose as a matter of law a finding of strict products liability." *Stark*, 21 F. App'x at 376 (citing *Matthews v. Hyster Co., Inc.*, 854 F.2d 1166, 1168 (9th Cir. 1988) (citing Restatement (Second) of Torts, § 402A (1965))).

III. Defendant Warren Pumps's Motion for Summary Judgment

A. Defendant's Arguments

<u>Product Identification/Causation</u>

Warren Pumps contends that Plaintiff's evidence is insufficient to establish that any product for which it is responsible caused the illness at issue.

<u>Bare Metal Defense</u>

Warren Pumps asserts that it has no duty to warn about and cannot be liable for injury arising from any product or component part that it did not manufacture or supply.

B. Plaintiff's Arguments

Product Identification / Causation / Bare Metal Defense

Plaintiff contends that he has identified sufficient product identification/causation evidence to survive summary judgment. In support of this assertion, Plaintiff cites to the following evidence, which Plaintiff represents is as follows:

- Deposition of Plaintiff

  Plaintiff testified that he worked aboard the *USS Turner* in the two engine and two fire rooms. He testified that he worked around every pump in each of four rooms, while it was being repacked. He testified that he was exposed to respirable dust from packing and sometimes insulation on each of the pumps. He identified three main brands of pumps in those rooms: Warren, Buffalo, and DeLaval.

  (Pl. Ex. A, Doc. No. 301.)

- Various Documents

  Plaintiff points to various documents and testimony to establish the following: (1) Warren supplied several pumps for the ship at issue, (2) Warren supplied its pumps with asbestos-containing insulation, gaskets, and packing, and (3) Warren arranged for asbestos lagging to be used on at least one of the pumps aboard the ship.

  (Pl. Exs. B to D, Doc. Nos. 301 and 301-1.)

- Expert Affidavit of Arthur Faherty

  Expert Arthur Faherty provides testimony that (1) "Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendant was entirely, removed," and (2) "The removal of the entire initial asbestos never occurred."

  (Pl. Ex. E, Doc. No. 301-1 at ¶¶ 44–45.)

- Expert Affidavit of Capt. R. Bruce Woodruff

  Expert Capt. Woodruff discusses the fact that assessment and overhaul of the *USS Turner* occurred in the period 1957 to 1960 and that a recommendation was made in 1957 to replace 75% of the lagging in the engineering spaces during an overhaul in 1960.

  (Pl. Ex. E, Doc. Nos. 301-1 and 301-2)

With respect to the so-called "bare metal defense," Plaintiff contends that, where a Defendant supplied a product with original asbestos-containing components parts (or accompanying external insulation), the burden is on Defendant to establish that all of this original asbestos was removed prior to Plaintiff's exposure to the product. According to Plaintiff, in the absence of such proof by Defendant, there is a fact question as to whether any of the original asbestos was still present at the time of his alleged exposure.

C. Analysis

Plaintiff alleges that he was exposed to asbestos from packing and insulation used in connection with Warren pumps. There is evidence that Warren pumps were aboard the ship on which Plaintiff worked. There is evidence that Warren supplied asbestos-containing gaskets, packing, and insulation with these pumps. There is evidence that, during the period 1957 to 1960, Plaintiff was exposed to respirable dust from gaskets inside these pumps, and from external insulation on some of these pumps.

Importantly, however, there is no evidence that Plaintiff was exposed to respirable asbestos dust from packing or insulation supplied by Warren (either as an original part or a replacement part). Although Plaintiff points to expert evidence to support his contention that some of the original asbestos material supplied by Warren was still present on the ship at the time of Plaintiff's alleged exposure, this evidence is nonetheless impermissibly speculative. Neither expert Faherty nor Captain Woodruff served aboard the ship at issue, and each concedes that at least some of the original asbestos material aboard the ship would have been removed prior to Plaintiff's alleged exposure. The evidence cited by Captain Woodruff that a recommendation was made in 1957 to replace 75% of the lagging on board certain areas of the ship in 1960 does not establish that the lagging had not been previously replace and, in fact, suggests that at least 25% had already been replaced. In fact, Plaintiff concedes that he is not able to establish that he was exposed to original asbestos, and instead contends that the burden is on Defendants to establish that all original asbestos (or replacement asbestos supplied by Defendant) had been removed from the ship prior to Plaintiff's exposures thereon. The Court has previously rejected this proposition, and has made clear that, under maritime law, the burden is on the Plaintiff to establish exposure to a product manufactured or supplied by Defendant. See *Conner*, 842 F.Supp.2d at 797.

In short, no reasonable jury could conclude from the evidence that Plaintiff was exposed to asbestos from a product manufactured or supplied by Warren such that it was a substantial factor in the development of his illness, because any such finding would be based on conjecture. See *Lindstrom*, 424 F.3d at 492. Accordingly, summary judgment in favor of Defendant is warranted. *Anderson*, 477 U.S. at 248–50.

D. Conclusion

Summary judgment in favor of Defendant is granted with respect to all of Plaintiff's claims against it because Plaintiff has failed to identify sufficient evidence of product identification/causation.

E.D. Pa. No.
5:13-00474-ER

AND IT IS SO ORDERED.

/s/ Eduardo C. Robreno, J.
Eduardo C. Robreno J.

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JOHN B. DEVRIES, ET AL.,	:	CONSOLIDATED UNDER MDL 875
Plaintiffs,	:	
v.	:	
GENERAL ELECTRIC COMPANY, ET AL.,	:	E.D. PA CIVIL ACTION NO. 5:13-00474-ER
Defendants.	:	

O R D E R

AND NOW, this **1st day of October, 2014**, it is hereby **ORDERED** that the Motion for Summary Judgment of Defendant IMO Industries, Inc. (Doc. No. 273) is **GRANTED**.[1]

[1] This case was removed in January of 2013 from the Court of Common Pleas of Philadelphia to the United States District Court for the Eastern District of Pennsylvania as part of MDL-875.

Plaintiff alleges that he was exposed to asbestos while serving in the U.S. Navy during the time period 1957 to 1960. Defendant IMO Industries, Inc.'s predecessor, DeLaval Pumps ("DeLaval" or "DeLaval Pumps"), manufactured pumps used aboard ships. The alleged asbestos exposure pertinent to Defendant occurred while Plaintiff was aboard the following ship:

- *USS Turner*

Plaintiff asserts that he developed an asbestos-related illness as a result of his exposure to Defendant's asbestos-containing products.

Plaintiff brought claims against various defendants. Defendant DeLaval has moved for summary judgment, arguing that (1) there is insufficient evidence to establish causation with respect to its product(s), and (2) it is entitled to summary judgment on grounds of the bare metal defense.

The parties assert that maritime law applies.

II. Legal Standard

A. Summary Judgment Standard

Summary judgment is appropriate if there is no genuine dispute as to any material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(a). "A motion for summary judgment will not be defeated by 'the mere existence' of some disputed facts, but will be denied when there is a genuine issue of material fact." *Am. Eagle Outfitters v. Lyle & Scott Ltd.*, 584 F.3d 575, 581 (3d Cir. 2009) (quoting *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 247–248 (1986)). A fact is "material" if proof of its existence or non-existence might affect the outcome of the litigation, and a dispute is "genuine" if "the evidence is such that a reasonable jury could return a verdict for the nonmoving party." *Anderson*, 477 U.S. at 248.

In undertaking this analysis, the court views the facts in the light most favorable to the non-moving party. "After making all reasonable inferences in the nonmoving party's favor, there is a genuine issue of material fact if a reasonable jury could find for the nonmoving party." *Pignataro v. Port Auth. of N.Y. & N.J.*, 593 F.3d 265, 268 (3d Cir. 2010) (citing *Reliance Ins. Co. v. Moessner*, 121 F.3d 895, 900 (3d Cir. 1997)). While the moving party bears the initial burden of showing the absence of a genuine issue of material fact, meeting this obligation shifts the burden to the non-moving party who must "set forth specific facts showing that there is a genuine issue for trial." *Anderson*, 477 U.S. at 250.

B. The Applicable Law

The parties assert that maritime law applies. Whether maritime law is applicable is a threshold dispute that is a question of federal law, *see* U.S. Const. Art. III, § 2; 28 U.S.C. § 1333(1), and is therefore governed by the law of the circuit in which this MDL court sits. *See Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362 (E.D. Pa. 2009) (Robreno, J.). This court has previously set forth guidance on this issue. *See Conner v. Alfa Laval, Inc.*, 799 F. Supp. 2d 455 (E.D. Pa. 2011) (Robreno, J.).

In order for maritime law to apply, a plaintiff's exposure underlying a products liability claim must meet both a locality test and a connection test. Id. at 463–66 (discussing *Jerome B. Grubart, Inc. v. Great Lakes Dredge & Dock Co.*, 513 U.S. 527, 534, 115 S.Ct. 1043, 130 L.Ed.2d 1024 (1995)). The locality test requires that the tort occur on navigable waters or, for injuries suffered on land, that the injury be caused by a vessel on navigable waters. Id. In assessing whether work was on "navigable waters" (i.e., was sea-based) it is important to note that work performed aboard a ship that is docked at the shipyard is sea-based work, performed on navigable waters. See *Sisson v. Ruby*, 497 U.S. 358, 110 S.Ct. 2892, 111 L.Ed.2d 292 (1990). This Court has previously clarified that this includes work aboard a ship that is in "dry dock." See *Deuber v. Asbestos Corp. Ltd.*, No. 10–78931, 2011 WL 6415339, at *1 n. 1 (E.D.Pa. Dec. 2, 2011) (Robreno, J.) (applying maritime law to ship in "dry dock" for overhaul). By contrast, work performed in other areas of the shipyard or on a dock, (such as work performed at a machine shop in the shipyard, for example, as was the case with the Willis plaintiff discussed in *Conner*) is land-based work. The connection test requires that the incident could have " 'a potentially disruptive impact on maritime commerce,' " and that " 'the general character' of the 'activity giving rise to the incident' shows a 'substantial relationship to traditional maritime activity.' " *Grubart*, 513 U.S. at 534 (citing *Sisson*, 497 U.S. at 364, 365, and n. 2).

Locality Test

If a service member in the Navy performed some work at shipyards (on land) or docks (on land) as opposed to onboard a ship on navigable waters (which includes a ship docked at the shipyard, and includes those in "dry dock"), "the locality test is satisfied as long as some portion of the asbestos exposure occurred on a vessel on navigable waters." *Conner*, 799 F. Supp. 2d at 466; *Deuber*, 2011 WL

6415339, at *l n.1. If, however, the worker never sustained asbestos exposure onboard a vessel on navigable waters, then the locality test is not met and state law applies.

Connection Test

When a worker whose claims meet the locality test was primarily sea-based during the asbestos exposure, those claims will almost always meet the connection test necessary for the application of maritime law. *Conner*, 799 F. Supp. 2d at 467–69 (citing *Grubart*, 513 U.S. at 534). This is particularly true in cases in which the exposure has arisen as a result of work aboard Navy vessels, either by Navy personnel or shipyard workers. *See id.* But if the worker's exposure was primarily land-based, then, even if the claims could meet the locality test, they do not meet the connection test and state law (rather than maritime law) applies. *Id.*

The alleged exposures pertinent to Defendant occurred aboard a ship. Therefore, these exposures were during sea-based work. *See Conner*, 799 F. Supp. 2d 455; *Deuber*, 2011 WL 6415339, at *1 n.1. Accordingly, maritime law is applicable to Plaintiff's claims against Defendant. *See id.* at 462–63.

C. Bare Metal Defense Under Maritime Law

This Court has held that the so-called "bare metal defense" is recognized by maritime law, such that a manufacturer has no liability for harms caused by – and no duty to warn about hazards associated with – a product it did not manufacture or distribute. *Conner*

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v. Alfa Laval, Inc., 842 F. Supp. 2d 791, 801 (E.D. Pa. 2012) (Robreno, J.).

D. Product Identification/Causation Under Maritime Law

In order to establish causation for an asbestos claim under maritime law, a plaintiff must show, for each defendant, that "(1) he was exposed to the defendant's product, and (2) the product was a substantial factor in causing the injury he suffered." *Lindstrom v. A-C Prod. Liab. Trust*, 424 F.3d 488, 492 (6th Cir. 2005); citing *Stark v. Armstrong World Indus., Inc.*, 21 F. App'x 371, 375 (6th Cir. 2001). This Court has also noted that, in light of its holding in *Conner*, 842 F. Supp. 2d 791, there is also a requirement (implicit in the test set forth in *Lindstrom* and *Stark*) that a plaintiff show that (3) the defendant manufactured or distributed the asbestos-containing product to which exposure is alleged. *Abbay v. Armstrong Int'l., Inc.*, No. 10-83248, 2012 WL 975837, at *l n.l (E.D. Pa. Feb. 29, 2012) (Robreno, J.).

Substantial factor causation is determined with respect to each defendant separately. *Stark*, 21 F. App'x. at 375. In establishing causation, a plaintiff may rely upon direct evidence (such as testimony of the plaintiff or decedent who experienced the exposure, co-worker testimony, or eye-witness testimony) or circumstantial evidence that will support an inference that there was exposure to the defendant's product for some length of time. *Id.* at 376 (quoting *Harbour v. Armstrong World Indus., Inc.*, No. 90-1414, 1991 WL 65201; at *4 (6th Cir. April 25, 1991)).

A mere "minimal exposure" to a defendant's product is insufficient to establish causation. *Lindstrom*, 424 F.3d at 492. "Likewise, a mere showing that defendant's product was present somewhere at plaintiff's place of work is insufficient." *Id.* Rather, the plaintiff must show "'a high enough level of exposure that an inference that the asbestos was a substantial factor in the injury is more than conjectural.'" *Id.* (quoting *Harbour*, 1991 WL 65201, at *4). The exposure must have been "actual" or "real", but the question of "substantiality" is one of degree normally best left to the fact-finder. *Redland Soccer Club. Inc. v. Dep't of Army of U.S.*, 55 F.3d 827, 851 (3d Cir. 1995). "Total failure to show that the defect caused or contributed to the accident will foreclose as a matter of law a finding of strict products liability." *Stark*, 21 F. App'x at 376 (citing *Matthews v. Hyster Co., Inc.*, 854 F.2d 1166, 1168 (9th Cir. 1988) (citing Restatement (Second) of Torts, § 402A (1965))).

III. Defendant IMO Industries's Motion for Summary Judgment

A. Defendant's Arguments

Product Identification/Causation

Defendant contends that Plaintiff's evidence is insufficient to establish that any product for which it is responsible caused the illness at issue.

Bare Metal Defense

Defendant argues that it has no duty to warn about and cannot be liable for injury arising from any product or component part that it did not manufacture or supply.

B. Plaintiff's Arguments

Product Identification / Causation / Bare Metal Defense

Plaintiff contends that he has identified sufficient product identification/causation evidence to survive summary judgment. In support of this assertion, Plaintiff cites to the following evidence, which Plaintiff represents is as follows:

- Deposition of Plaintiff

  Plaintiff testified that he worked aboard the *USS Turner* in the two engine and two fire rooms. He identified three main brands of pumps in those rooms: Warren, Buffalo, and DeLaval. He testified that he worked around every pump in each of four rooms, while it was being repacked. He testified that he was exposed to respirable dust from packing and sometimes insulation on each of the pumps. He also testified that he was exposed to respirable dust from gaskets on DeLaval pumps.

  (Pl. Ex. E, Doc. No. 297.)

- Various Documents

  Plaintiff points to various documents and testimony to establish the following: (1) DeLaval supplied pumps for the ship at issue, (2) DeLaval supplied those pumps with asbestos-containing gaskets, (3) DeLaval arranged for asbestos insulation to be installed on the pumps, and (3) DeLaval supplied replacement asbestos gaskets for its pumps aboard the ship.

(Pl. Exs. B to D and F, Doc. Nos. 297 and 297-1.)

- Expert Affidavit of Arthur Faherty

  In connection with its opposition to another pump manufacturer's motion for summary judgment, Plaintiff pointed to the affidavit of expert Arthur Faherty, who provides testimony that (1) "Generally, if a company supplied asbestos with its equipment, some of that asbestos was always present unless the record shows that the asbestos installed by the defendant was entirely, removed," and (2) "The removal of the entire initial asbestos never occurred."

  (Pl. Ex. E, Doc. No. 301-1 at ¶¶ 44–45.)

- Expert Affidavit of Capt. R. Bruce Woodruff

  In connection with its opposition to another pump manufacturer's motion for summary-judgment, Plaintiff pointed to the affidavit of expert Capt. Woodruff, who discusses the fact that assessment and overhaul of the USS Turner occurred in the period 1957 to 1960 and that a recommendation was made in 1957 to replace 75% of the lagging in the engineering spaces during an overhaul in 1960.

  (Pl. Ex. E, Doc. Nos. 301-1 and 301-2)

With respect to the so-called "bare metal defense," Plaintiff contends that, where a Defendant supplied a product with original asbestos-containing components parts (or accompanying external insulation), the burden is on Defendant to establish that all of this original asbestos was removed prior to Plaintiff's exposure to the product. According to Plaintiff, in the absence of such proof by Defendant, there is a fact question as to whether any of the original asbestos was still present at the time of his alleged exposure.

C. Analysis

Plaintiff alleges that he was exposed to asbestos from gaskets, packing and insulation used in connection with DeLaval pumps. There is evidence that DeLaval pumps were aboard the ship on which Plaintiff worked. There is evidence that DeLaval supplied asbestos-containing gaskets with these pumps, and that it arranged for installation of external asbestos insulation on these pumps. There is also evidence that DeLaval supplied some asbestos replacement gaskets to the ship at issue, for use with its pumps. There is evidence that, during the period 1957 to 1960, Plaintiff was exposed to respirable dust from gaskets (and perhaps packing) inside these pumps, and from external insulation on some of these pumps.

Importantly, however, there is no evidence that Plaintiff was exposed to respirable asbestos dust from gaskets, packing, or insulation supplied by DeLaval (either as an original part or a replacement part). Although Plaintiff points (in connection with his opposition to the motion for summary judgment of Warren Pumps, another pump manufacturer defendant in this action) to expert evidence to support his contention that some of the original asbestos material supplied by DeLaval was still present on the ship at the time of Plaintiff's alleged exposure, this evidence is nonetheless impermissibly speculative. Neither expert Faherty nor Captain Woodruff served aboard the ship at issue, and each concedes that at least some of the original asbestos material aboard the ship would have been removed prior to Plaintiff's alleged exposure. The evidence cited by Captain Woodruff that a recommendation was made in 1957 to replace 75% of the lagging on board certain areas of the ship in 1960 does not establish that the lagging had not been previously replaced and, in fact, suggests that at least 25% had already been replaced. Moreover, Plaintiff concedes that he is not able to establish that he was exposed to original asbestos, and instead contends that the burden is on Defendants to establish that all original asbestos (or replacement asbestos supplied by Defendant) had been removed from the ship prior to Plaintiff's exposures thereon. The Court has previously rejected this proposition, and has made clear that, under maritime law, the burden is on the Plaintiff to establish exposure to a product manufactured or supplied by Defendant. See *Conner*, 842 F.Supp.2d at 7 97.

In short, no reasonable jury could conclude from the evidence that Plaintiff was exposed to asbestos from a product manufactured or supplied by Warren such that it was a substantial factor in the development of his illness, because any such finding would be based on conjecture. See *Lindstrom*, 424 F.3d at 492. Accordingly, summary judgment in favor of Defendant is warranted. *Anderson*, 477 U.S. at 248–50.

D. Conclusion

Summary judgment in favor of Defendant is granted with respect to all of Plaintiff's claims against it because Plaintiff has failed to identify sufficient evidence of product identification/causation.

E.D. Pa. No.
5:13-00474-ER

AND IT IS SO ORDERED.

/s/ Eduardo C. Robreno, J.
Eduardo C. Robreno J.

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JOHN B. DEVRIES, ET AL.,	:	CONSOLIDATED UNDER MDL 875
Plaintiffs,	:	
v.	:	
GENERAL ELECTRIC COMPANY, ET AL.,	:	E.D. PA CIVIL ACTION NO. 5:13-00474-ER
Defendants.	:	

O R D E R

AND NOW, this **10th day of October, 2014**, it is hereby **ORDERED** that the Motion for Summary Judgment of Defendant General Electric Company (Doc. No. 270) is **GRANTED**.[1]

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[1] This case was removed in January of 2013 from the Court of Common Pleas of Philadelphia to the United States District Court for the Eastern District of Pennsylvania as part of MDL-875.

Plaintiff alleges that he was exposed to asbestos while serving in the U.S. Navy during the time period of 1957 to 1960. Plaintiff alleges that Defendant General Electric Company ("GE" or "General Electric") manufactured turbines used aboard ships. The alleged asbestos exposure pertinent to Defendant GE occurred while Plaintiff was aboard the following ship:

- *USS Turner*

Plaintiff asserts that he developed an asbestos-related illness as a result of his exposure to Defendant's products.

Plaintiff brought claims against various defendants. Defendant GE has moved for summary judgment, arguing that (1) there is insufficient evidence to establish causation with respect to its product(s), (2) it is entitled to summary judgment on grounds of the bare metal defense, and (3) it is immune from liability by way of the government contractor defense.

The parties assert that maritime law applies.

II. Legal Standard

A. Summary Judgment Standard

Summary judgment is appropriate if there is no genuine dispute as to any material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(a). "A motion for summary judgment will not be defeated by 'the mere existence' of some disputed facts, but will be denied when there is a genuine issue of material fact." *Am. Eagle Outfitters v. Lyle & Scott Ltd.*, 584 F.3d 575, 581 (3d Cir. 2009) (quoting *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 247–248 (1986)). A fact is "material" if proof of its existence or non-existence might affect the outcome of the litigation, and a dispute is "genuine" if "the evidence is such that a reasonable jury could return a verdict for the nonmoving party." *Anderson*, 477 U.S. at 248.

In undertaking this analysis, the court views the facts in the light most favorable to the non-moving party. "After making all reasonable inferences in the nonmoving party's favor, there is a genuine issue of material fact if a reasonable jury could find for the nonmoving party." *Pignataro v. Port Auth. of N.Y. & N.J.*, 593 F.3d 265, 268 (3d Cir. 2010) (citing *Reliance Ins. Co. v. Moessner*, 121 F.3d 895, 900 (3d Cir. 1997)). While the moving party bears the initial burden of showing the absence of a genuine issue of material fact, meeting this obligation shifts the burden to the non-moving party who must "set forth specific facts showing that there is a genuine issue for trial." *Anderson*, 477 U.S. at 250.

B. The Applicable Law

1. Government Contractor Defense (Federal Law)

Defendant's motion for summary judgment on the basis of the government contractor defense is governed by federal law. In matters of federal law, the MDL transferee court applies the law of the circuit where it sits, which in this case is the law of the U.S. Court of Appeals for the Third Circuit. *Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362–63·(E.D. Pa. 2009) (Robreno, J.).

2. State Law Issues (Maritime versus State Law)

The parties assert that maritime law applies. Whether maritime law is applicable is a threshold dispute that is a question of federal law, *see* U.S. Const. Art. III, § 2; 28 U.S.C. § 1333(1), and is therefore governed by the law of the circuit in which this MDL court sits. *See Various Plaintiffs v. Various Defendants ("Oil Field Cases")*, 673 F. Supp. 2d 358, 362 (E.D. Pa. 2009) (Robreno, J.). This court has previously set forth guidance on this issue. *See Conner v. Alfa Laval, Inc.*, 799 F. Supp. 2d 455 (E.D. Pa. 2011) (Robreno, J.).

In order for maritime law to apply, a plaintiff's exposure underlying a products liability claim must meet both a locality test and a connection test. *Id.* at 463–66 (discussing *Jerome B. Grubart, Inc. v. Great Lakes Dredge & Dock Co.*, 513 U.S. 527, 534 (1995)). The locality test requires that the tort occur on navigable waters or, for injuries suffered on land, that the injury be caused by a vessel on navigable waters. *Id.* In assessing whether work was on "navigable waters" (i.e., was sea-based) it is important to note that work performed aboard a ship that is docked at the shipyard is sea-based work, performed on navigable waters. *See Sisson v. Ruby*, 497 U.S. 358 (1990). This Court has previously clarified that this includes work aboard a ship that is in "dry dock." *See Deuber v. Asbestos Corp. Ltd.*, No. 10-78931, 2011 WL 6415339, at *l n.1 (E.D. Pa. Dec. 2, 2011) (Robreno, J.) (applying maritime law to ship in "dry dock" for overhaul). By contrast, work performed in other areas of the shipyard or on a dock, (such as work performed at a machine shop in the shipyard, for example, as was the case with the Willis plaintiff discussed in *Conner*) is land-based work. The connection test requires that the incident could have "'a potentially disruptive impact on maritime commerce,'" and that "'the general character' of the 'activity giving rise to the incident' shows a 'substantial relationship to traditional maritime activity.'" *Grubart*, 513 U.S. at 534 (citing *Sisson*, 497 U.S. at 364, 365, and n.2).

> Locality Test
>
> If a service member in the Navy performed some work at shipyards (on land) or docks (on land) as opposed to onboard a ship on navigable waters (which includes a ship docked at the shipyard, and includes those in "dry dock"), "the locality test is satisfied as long as some portion of the asbestos exposure occurred on a vessel on navigable waters." *Conner*, 799 F. Supp. 2d at 466; *Deuber*, 2011 WL 6415339, at *l n.1. If, however, the worker never sustained asbestos exposure onboard a vessel on navigable waters, then the locality test is not met and state law applies.
>
> Connection Test
>
> When a worker whose claims meet the locality test was primarily sea-based during the asbestos exposure, those claims will almost always meet the connection test necessary for the application of maritime law. *Conner*, 799 F. Supp. 2d at 467–69 (citing *Grubart*, 513 U.S. at 534). This is particularly true in cases in which the exposure has arisen as a result of work aboard Navy vessels, either by Navy personnel or shipyard workers. *See id*. But if the worker's exposure was primarily land-based, then, even if the claims could meet the locality test, they do not meet the connection test and state law (rather than maritime law) applies. *Id.*

The alleged exposures pertinent to Defendant occurred aboard a ship. Therefore, these exposures were during sea-based work. *See Conner*, 799 F. Supp. 2d 455; *Deuber*, 2011 WL 6415339, at *1 n.1. Accordingly, maritime law is applicable to Plaintiff's claims against Defendant. *See id.* at 462–63.

C. Bare Metal Defense Under Maritime Law

This Court has held that the so-called "bare metal defense" is recognized by maritime law, such that a manufacturer has no liability for harms caused by – and no duty to warn about hazards associated with – a product it did not manufacture or distribute. *Conner v. Alfa Laval, Inc.*, 842 F. Supp. 2d 791, 801 (E.D. Pa. 2012) (Robreno, J.).

D. Product Identification/Causation Under Maritime Law

In order to establish causation for an asbestos claim under maritime law, a plaintiff must show, for each defendant, that "(1) he was exposed to the defendant's product, and (2) the product was a substantial factor in causing the injury he suffered." *Lindstrom v. A-C Prod. Liab. Trust*, 424 F.3d 488, 492 (6th Cir. 2005); citing *Stark v. Armstrong World Indus., Inc.*, 21 F. App'x 371, 375 (6th Cir. 2001). This Court has also noted that, in light of its holding in *Conner*, 842 F. Supp. 2d 791, there is also a requirement (implicit in the test set forth in *Lindstrom* and *Stark*) that a plaintiff show that (3) the defendant manufactured or distributed the asbestos-containing product to which exposure is alleged. *Abbay v. Armstrong Int'l., Inc.*, No. 10-83248, 2012 WL 975837, at *l n.l (E.D. Pa. Feb. 29, 2012) (Robreno, J.).

Substantial factor causation is determined with respect to each defendant separately. *Stark*, 21 F.

App'x. at 375. In establishing causation, a plaintiff may rely upon direct evidence (such as testimony of the plaintiff or decedent who experienced the exposure, co-worker testimony, or eye-witness testimony) or circumstantial evidence that will support an inference that there was exposure to the defendant's product for some length of time. *Id.* at 376 (quoting *Harbour v. Armstrong World Indus., Inc.*, No. 90-1414, 1991 WL 65201; at *4 (6th Cir. April 25, 1991)).

A mere "minimal exposure" to a defendant's product is insufficient to establish causation. *Lindstrom*, 424 F.3d at 492. "Likewise, a mere showing that defendant's product was present somewhere at plaintiff's place of work is insufficient." *Id.* Rather, the plaintiff must show "'a high enough level of exposure that an inference that the asbestos was a substantial factor in the injury is more than conjectural.'" *Id.* (quoting *Harbour*, 1991 WL 65201, at *4). The exposure must have been "actual" or "real", but the question of "substantiality" is one of degree normally best left to the fact-finder. *Redland Soccer Club. Inc. v. Dep't of Army of U.S.*, 55 F.3d 827, 851 (3d Cir. 1995). "Total failure to show that the defect caused or contributed to the accident will foreclose as a matter of law a finding of strict products liability." *Stark*, 21 F. App'x at 376 (citing *Matthews v. Hyster Co., Inc.*, 854 F.2d 1166, 1168 (9th Cir. 1988) (citing Restatement (Second) of Torts, § 402A (1965))).

III. Defendant General Electric's Motion for Summary Judgment

A. Defendant's Arguments

Product Identification/Causation

Defendant contends that Plaintiff's evidence is insufficient to establish that any product for which it is responsible caused the illness at issue.

Bare Metal Defense

Defendant asserts that it has no duty to warn about and cannot be liable for injury arising from any product or component part that it did not manufacture or supply.

Government Contractor Defense

Defendant asserts the government contractor defense, arguing that it is immune from liability in this case because the Navy exercised discretion and approved the warnings supplied by Defendant for the products at issue, Defendant provided warnings that conformed to the Navy's approved warnings, and the Navy knew about asbestos and its hazards.

B. Plaintiff's Arguments

Product Identification / Causation / Bare Metal Defense

Plaintiff contends that he has identified sufficient product identification/causation evidence to survive summary judgment. In support of this assertion, Plaintiff cites to the following evidence, which Plaintiff represents is as follows:

- Deposition of Plaintiff

Plaintiff testified that he worked aboard the *USS Turner* in the two engine and two fire rooms. He testified that there were two GE turbines aboard the ship. He testified that he was present when repair work was being done on these turbines, releasing dust from the external insulation.

(Pl. Ex. A, Doc. No. 294.)

- GE specification for Heat Insulation Material

  Plaintiff points to a single document for his assertion that GE required (and perhaps also arrange for) asbestos on its turbines. The document, which is labeled to be a GE specification for heal insulation material, indicates that (1) asbestos insulation should be used with turbines, (2) the turbine vendor (presumably GE) sometimes provides insulation with the turbine, and (3) the insulation for a turbine is sometimes supplied by entities other than the turbine vendor.

  (Pl. Ex. B, Doc. No. 294)

With respect to the so-called "bare metal defense," Plaintiff contends that, where a Defendant supplied a product with original asbestos-containing components parts (or accompanying external insulation), the burden is on Defendant to establish that all of this original asbestos was removed prior to Plaintiff's exposure to the product. According to Plaintiff, in the absence of such proof by Defendant, there is a fact question as to whether any of the original asbestos was still present at the time of his alleged exposure.

Government Contractor Defense

Plaintiff argues that summary judgment in favor of Defendant on grounds of the government contractor defense is not warranted because there are genuine issues of material fact regarding its availability to Defendant. Plaintiff cites to various military specifications, including, *inter alia*, MIL-M-15071, which, he argues, show that the Navy did not prohibit Defendant from providing warnings with its products and, instead, left the nature and provision of any such warnings for determination by Defendants.

C. Analysis

Plaintiff alleges that he was exposed to asbestos from repair work done on GE turbines. There is evidence that Plaintiff was exposed to respirable dust from external insulation used in connection with GE turbines. There is evidence that GE specifications indicated asbestos insulation should be used with turbines. Importantly, however, there is no evidence that GE manufactured or supplied the insulation to which Plaintiff was exposed. The Court has reviewed the sole document (Exhibit B, Doc. No. 294) on which Plaintiff relies for his contention that GE required and perhaps "arranged" for asbestos insulation on the equipment. Although this document (a GE specification for heat insulation material) indicates that asbestos insulation should be used with turbines, at best it indicates only that it is possible that GE provided the insulation at issue and to which Plaintiff was exposed. In fact, the same document indicates that the insulation for a turbine is sometimes supplied by entities other than the turbine vendor. Therefore, even assuming, as Plaintiff implies, that "arranging" for asbestos insulation is the same as "supplying" it (an issue this Court need not reach), Plaintiff's evidence fails to establish that GE arranged for asbestos insulation on the equipment at issue. As such, no reasonable jury could conclude from the evidence that Plaintiff was exposed to asbestos from a product manufactured or supplied by Defendant such that it was a substantial factor in the development of his illness, because any such finding would be based on conjecture. *See Lindstrom*, 424 F.3d at 492. Accordingly, summary judgment in favor of Defendant is warranted. *Anderson*, 477 U.S. at 248–50.

In light of this determination, the Court need not reach Defendant's argument regarding the government contractor defense.

D. Conclusion

Summary judgment in favor of Defendant is granted with respect to all of Plaintiff's claims against it because Plaintiff has failed to identify sufficient evidence of product identification/causation.

E.D. Pa. No.
5:13-00474-ER

AND IT IS SO ORDERED.

/s/ Eduardo C. Robreno, J.
Eduardo C. Robreno J.

* * *

MIL-M-15071D(SHIPS)

3.3 Text. -

3.3.1 Wording. - The text shall be factual, specific, concise, and clearly worded to be readily understandable by personnel involved in the operation, repair, overhaul and maintenance of the equipment, and to provide sufficient information for technicians to install, operate, service; and maintain the equipment at peak performance without the services of a manufacturer's representative. Technical phraseology requiring a specialized knowledge shall be avoided except where no other wording will convey the intended meaning, in which case the technical term shall be defined.

3.3.2 Level of writing. - As a general guide, the level of writing should be that for a high school graduate having specialized training as a technician through Navy training courses.

3.3.3 Figures. - Sectional views of assemblies, sub-assemblies and the component parts thereof shall be shown as necessary to supplement the text, photographs, and drawings and aid in the identification of parts. Identification of illustrated parts with listed parts shall be facilitated by the use of index (or piece) numbers and arrows which will identify assemblies, sub-assemblies and component parts thereof.

3.3.4 Indexing and referencing of figures. - Significant features or components of figures shall be identified by brief applicable nomenclature with arrows. Index (or piece) numbers may be used on figures when an extremely large amount of nomenclature is required.

3.3.5 Deleted figures. - When a change requires deletion of a figure without substitution of another, the following sentence shall be inserted "Figure _______ deleted" in or near the place of deletion.

3.3.6 Notes, cautions and warnings. - Notes, cautions, and warnings should be used to emphasize important and critical instructions. The use should be as sparing as is consistent with real need. When used, notes, cautions and warnings should immediately precede the applicable instructions and shall be selected in accordance with the following definitions:

(a)"NOTE" - An operating procedure, condition, etc., which it is essential to highlight.

(b) "CAUTION" - Operating procedures, practices; etc., when if not strictly observed, will result in damage or destruction of equipment.

(c) "WARNING" - Operating procedures, practices, etc., which will result in personal injury or loss of life if not correctly followed.

* * *

JOHN B. DeVRIES

* * *

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machinist mates.

Were there — were all of those different rankings present in the engine rooms to do work on a typical shift?

A. No.

Q. Okay. There wasn't a time — how — how did you — how did a machinist mate know to go to the engine room?

A. Well, they had watches.

Q. Okay.

A. And they would be assigned to a watch.

Q. Again, I'm going to talk — now, I'm going to turn on — onto talking specifically about Warren. And you indicated that Warren manufactured pumps that were on the TURNER

A. Correct.

Q. Correct?

A. And Exhibit 2 confirms my memory.

Q. Okay. Do you know how many pumps that you believe were manufactured by Warren actually were on the TURNER?

A. Other than Exhibit 2 of my own memory I don't know.

Q. Okay. Do you know where any — do you

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have a recollection as you sit here today where the Warren pumps were located on the TURNER?

A. Warren pumps were in the fire rooms and engine rooms.

Q. Any particular location in the fire room that you recall a Warren pump being located?

A. No.

Q. How about in the engine rooms, do you recall a specific area where a Warren pump was —

A. No.

Q. — located? Do you know any of the different pump — strike that. Pumps, there are all different types of pumps. You talked with Mr. Stokes earlier about that, correct?

A. Yes.

Q. Do you know the types of Warren pumps that were located on the TURNER?

A. I don't know the different types of Warren pumps that were on the TURNER. Again, Exhibit 2 has information.

Q. But as you sit here today you don't have —

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A. I don't have a recollection.

Q. Okay. Do you know if any of the Warren pumps were horizontal versus vertical?

A. I don't recollect.

Q. Okay. Would you be able to as you sit here today describe the physical size or dimension of any of the Warren pumps?

A. They varied widely.

Q. Okay. Did they vary widely between al different pumps located on the TURNER or are you saying the Warren pumps themselves varied in size?

A. I wouldn't know, but I refer to Exhibit 2.

Q. Okay. And I understand we went through some documents. I'm just trying to get a feel of what you recall as you sit here today without the documents. Okay? Do you recall as you sit here today actually seeing any

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nameplates or any markings that designated it as a Warren pump?

A. No, but —

Q. You can go on and explain.

A. But, again, there were nameplates on some pumps. I just don't remember whose nameplate was on what.

Q. Okay. You talked specifically with Mr. Stokes about some work that was performed in these engine spaces on the TURNER that you witnessed. And one was removing stuffing from the stuffing box on pumps.

A. Or repacking.

Q. Okay. I was going to try to get that word to see if that's what you referred to. As you sit here today, do you recall being in an area when a Warren pump would have been prepacked?

A. I was present for a number of repacking of everybody's pumps. The pumps were a problem on this ship which was in poor repair initially, and as I indicated to Mr. Stokes, didn't have the right tools to pull the packing so — and also, we didn't have many

* * *

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failure or product liability maybe.

Q. And what product was involved in this case?

A. This was a product called Korad, K O R A D, acrylic film.

Q. Do you know who was suing or who was the plaintiff in that case, not specifically, but maybe if it was a worker or —

A. No. This was an industrial dispute.

Q. Okay. And what was the dispute over? You don't have to tell me pages and pages, but —

A. Product performance or product misuse.

Q. No one was injured because of the product?

A. No.

Q. Okay. Sir, I have one final question or a couple final questions for Warren that I failed to ask you. As you sit here today, sir, do you have any belief that any of the work that was performed to any of the Warren pumps aboard the TURNER exposed you to asbestos?

A. Yes.

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Q. And what aspect of the work or what work?

A. Well, number one, removal of insulation created a cloud of dust. And I was in that could of dust.

Q. Okay.

A. Number two, the repacking which we've talked about And, number three, the seals on the flanges which we've talked about.

Q. Okay. And as far as your basis for any of the insulation or the packing or the sealing work containing asbestos, what is the basis of your belief that those products contained asbestos?

A. It was well known in the profession, in the industry that asbestos was the only way to insulate high temperatures. Whereas I couldn't say and earlier today I couldn't say I saw it, I know it was asbestos. I know if should have been asbestos.

Q. So your basis is a link to a high temperature connection; correct?

A. Specification of a high temperature asbestos insulation or packing or seal.

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Q. Okay. And I think we talked to this with Mr. Stokes. As far as any of the insulation, the repacking or the seal work that you associate with Warren pump, would you know the manufacturer of any of the insulation?

A. No.

Q. Would you know any of the manufacturers of the old packing or the new packing.

A. No.

MR. REICH: We're not going to go through the same questions that we went through.

MS. SCHWEIZER: That's it.

MR. REICH: Okay.

MS. SCHWEIZER: That's it. I'm done.

MR. REICH: Only because there are too many people.

MS. SCHWEIZER: You're absolutely right. I'm done. Thank you very much.

MR. REICH: I have some questions.

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MS. SCHWEIZER: Okay.

- - -

EXAMINATION

- - -

BY MR. REICH:

Q. You said, Mr. DeVries that you were exposed to asbestos with regard to the Warren pumps when the repacking was done. Can you tell us why or how you believed you were exposed to dust when repacking was done on the many Warren pumps?

MS. SCHWEIZER: Objection, form and also assumes facts not in evidence.

THE WITNESS: When the repacking — when the packing was pulled, I had to show some sailors how to do it and others just to supervise. And that meant that — like being next to you —

BY MR. REICH:

Q. Indicating about a foot away?

A. Yeah. Being next to you, so of course, I was breathing the dust.

Q. And how was removing the old packing creating dust?

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A. As I told Mr. Stokes, the proper way is a packing removal tool. But since we didn't have it we would use screwdrivers.

Q. And what would happen?

A. And pry and chip and break up the packing.

Q. Okay. And did the —

A. The old packing.

Q. And what would happen when the old packing was broken up?

A. Go up in the air.

Q. Okay. And did you breathe that?

MS. SCHWEIZER: Objection, form.

THE WITNESS: I was going to say, it was a cloud and I was breathing the cloud.

BY MR. REICH:

Q. Okay. And what about the new packing, what if anything, had to be done to the new packing in order to replace the old packing?

MS. SCHWEIZER: Form, asked and answered.

BY MR. REICH:

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Q. You can answer that.

A. Okay. I — [illegible] many times.

Q. Okay. Ane what if anything, would happen when the piece of new packing was cut?

A. Usually not much.

Q. Okay. And what had to be done to this new packing?

A. Put around the shaft, wrapped around it. It depends on the pump design.

Q. Okay. And did handling that new packing cause any of the packing material to come apart or come off?

MS. SCHWEIZER: Objection, form.

THE WITNESS: Probably some.

BY MR. REICH:

Q. Okay. And you talked also about seals. Are the seals different than the repacking that you told us about on the pumps?

A. Some, yes. But I was [illegible] the seals on the flange, the mounting flanges.

Q. Okay. Tell us about the seals on the mounting flanges or the Warren pumps that you

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were responsible for supervising on the TURNER.

MS. SCHWEIZER: Form, mischaracterization.

MR. REICH: I'm sorry?

MS. SCHWEIZER: Go ahead.

MR. REICH: I didn't hear it.

MS. SCHWEIZER: Form and mischaracterization.

MR. REICH: Okay.

MS. SCHWEIZER: He actually indicated that he did not do that on Warren, but go ahead.

BY MR. REICH:

Q. Go ahead.

A. Well, they had to be scraped clean because when you broke the seal, broke the pipe from the pump, the seal would break. And you'd have to scrape it clean, wire brush as I said earlier.

Q. And what would happen when you scraped and wire brushed —

A. You'd get a cloud of dust.

Q. Okay. Now, did the gasket or seal did

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that come off in one piece?

A. No. It broke.

MS. SCHWEIZER: Objection, form.

BY MR. REICH:

Q. Okay. And when it broke how much of it might stick to the flange?

A. Sometimes a lot. Sometimes not so much. Always something. It always had to be some sort of scraping or brushing or both.

Q. Okay. And what kind of brushing was done on the flanges on the Warren pumps when they were being repaired or maintained?

MS. SCHWEIZER: Form.

THE WITNESS: I can only say that any time you cleaned a flange you would scrape and brush. And I can't say on which pump and flanges and which didn't. But since we didn't have screwed fittings most all had flanges.

BY MR. REICH:

Q. And the changing of the packing and replacement of the seals and the flanges, how frequently would that have to be done on the

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various Warren pumps?

MS. SCHWEIZER: Form.

BY MR. REICH:

Q. You can answer that.

A. I don't know.

Q. Okay. Over the three year period that you were on the TURNER and responsible for that equipment, can you estimate for us how frequently or how many times that would have been done on a Warren pump?

MS. SCHWEIZER: Form, asked and answered

THE WITNESS: I can — I can estimate that some pumps had to be done it seemed like every week or two. They were out of alignment, the frame they were on was rusted through or had bent, moved. Others went their normal life.

BY MR. REICH:

Q. And you talked a little bit about insulation that was on the outside of the Warren pumps?

A. Outside of —

MS. SCHWEIZER: Form.

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THE WITNESS: — any pump that, again, that was hot and needed to be insulated.

BY MR. REICH:

Q. Okay. That's what I was going to ask. What was the purpose of the insulation outside of some of the Warren pumps?

MS. SCHWEIZER: Objection, form and mischaracterization. He said that some of the pumps. He did not say some Warren pumps.

BY MR. REICH:

Q. Was there insulation on some, outside on some of the Warren pumps?

MS. SCHWEIZER: Objection, asked and answered.

THE WITNESS: I can't recollect with certainty that which pumps had insulation and which did not.

BY MR. REICH:

Q. Okay. And if there were Warren pumps with insulation on the outside, what would have to be done to that insulation when the pump was being serviced?

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MS. SCHWEIZER: Calls for speculation.

THE WITNES: It would have to be removed and then replaced in some manner.

BY MR. REICH:

Q. And what would happen when that insulation was being handled to remove it?

A. It would get —

MS. SCHWEIZER: Same objection.

THE WITNESS: it would get broken up and one of these clouds that I have mentioned would form.

BY MR. REICH:

Q. And did you breathe that dust?

MS. SCHWEIZER: Form.

THE WITNESS: I was right there.

BY MR. REICH:

Q. Okay. And when the insulation on the same pump had to be replaced, what would happen?

MS. SCHWEIZER: Form.

THE WITNESS: If you replaced

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it and had in your spare parts an insulation blanket. If a blanket was used normally, you can replace it. Sometimes also people made up a slurry and that would be a slurry with asbestos or a mud to insulate.

BY MR. REICH:

Q. Okay. What was the purpose of this outside insulation on pumps?

MS. SCHWEIZER: Form, asked and answered.

THE WITNESS: One, one purpose was to keep people from getting burned. They primarily wanted to keep the heat in, not out.

BY MR. REICH:

Q. So those are the two purposes?

A. Yea.

Q. And was that because the pumps were malfunctioning or was this normal functioning of a pump with that near with it?

A. Depending on —

MS. SCHWEIZER: Form.

THE WITNESS: Depending on the application the pump would be designed to be insulated or an example [illegible] used fresh water

* * *

* * *

(c) each and every related company.

ANSWER:

See Preliminary Statement and General Objections, incorporated by reference herein. Warren objects to this Interrogatory as overbroad, unduly burdensome and irrelevant to the extent that it is not limited to the Warren pump(s) or time period relevant to Plaintiffs' claims against Warren. Warren further objects to this Interrogatory to the extent that it seeks information pertaining to any entity other than Warren Pumps, LLC, specifically any alleged "predecessor" or "related company." Moreover, Warren objects to the phrase "related company" as vague, ambiguous, and calling for speculation in addition to requiring a legal conclusion. Finally, Warren objects to this Interrogatory as argumentative in its implication that Warren is a manufacturer of "asbestos-containing products," which Warren denies. Warren's sole manufactured products are pumps.

17. State the first and last dates on which any asbestos-containing product was specified, sold, distributed, applied and/or installed within the United States by:

(a) Defendant;
(b) each and every predecessor, and,
(c) each and every related company.

ANSWER:

See Preliminary Statement and General Objections, incorporated by reference herein. Warren Pumps objects to this Interrogatory on the grounds that the term "specified" is vague, ambiguous, and argumentative.

Subject to and without waiver of the foregoing Preliminary Statement, General Objections, and specific objections, Warren states that it did not specify the use of asbestos-containing products. Rather, Warren Pumps are generally manufactured to the specifications of the customer such as the U.S. Navy. For instance, pursuant to government specifications, it manufactured pumps for U.S. Navy vessels that had to withstand the most severe combat conditions imaginable pursuant to government contracts utilizing materials tested and strictly specified by the United States Navy for utilization aboard U.S. Navy ships. For these pumps to withstand severe combat conditions, in Navy applications, for example, the U.S. Navy required the use of certain component parts such as gaskets or packing, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing components be purchased from certain manufactures that it had approved in advance. The date as to when Warren Pumps no longer used an asbestos-containing component such as a gasket or packing depended on the particular pump application. Should plaintiff identify a particular time period, pump and location, Warren Pumps will endeavor to determine whether additional information exists, but Warren pumps no longer contain asbestos-containing components.

18. State the last date on which Defendant or any related company specified, sold, distributed, applied and/or installed any asbestos-containing product outside the United States and identify by brand or trade name the products so specified, sold, distributed, applied and/or installed.

<u>ANSWER:</u>

See Preliminary Statement and General Objections, incorporated by reference herein. Warren Pumps objects to this Interrogatory on the grounds that the term "specified" is vague, ambiguous, and argumentative. Warren refers Plaintiff to its response to Interrogatory No. 17.

19. Identify by full and complete trade name, any and all asbestos-containing products as defined above, which this Defendant, any related company, or any predecessor(s) has, at any time:

(a) Designed;
(b) Manufactured;
(c) Processed;
(d) Sold;
(e) Distributed;
(f) Applied;
(g) Installed;
(h) Patented;
(i) Specified; or
(j) Re-labeled.

<u>ANSWER:</u>

See Preliminary Statement and General Objections, incorporated by reference herein. Warren objects to this Interrogatory as overbroad, unduly burdensome and irrelevant to the extent that it is not limited to the Warren pump(s) or time period relevant to Plaintiffs' claims against Warren. Warren further objects to this Interrogatory to the extent that it seeks information pertaining to any entity other than Warren Pumps, LLC, specifically any alleged "predecessor" or "related company." Moreover, Warren objects to the phrase "related company" as vague, ambiguous, and calling for speculation in addition to requiring a legal conclusion. Finally, Warren objects to this Interrogatory as argumentative in its implication that Warren is a manufacturer of "asbestos-containing products," which Warren denies. Warren's sole manufactured products are pumps.

Subject to and without waiver of the foregoing Preliminary Statement, General Objections, and specific objections, Warren states that it is a manufacturer of pumps only, which are made from metal alloys such as stainless steel, steel, cast iron, titanium, and bronze. Warren never manufactured "asbestos-containing products" such as gaskets, packing, or insulation. Moreover, Warren did not manufacture other equipment such as turbines, valves or piping, nor did Warren manufacture or supply flange gaskets. Warren never mined, milled, or purchased raw asbestos and was not part of the textile industry. Notwithstanding, Warren Pumps manufactured pumps that would pump various liquids at varying temperatures and viscosities. The types of pumps are almost too numerous to describe, however. The pumps could be broken down into three categories by how the pumping action was achieved: (1) Centrifugal, (2) Reciprocating, (3) Rotary or Screw.

(1) Centrifugal Pumps – Centrifugal pumps use an impeller within the pump to draw the liquid through the pump. There could be one or more than one impeller within the pump. For these pumps to withstand severe combat conditions, in Navy applications, for example, the U.S. Navy required the use of certain component parts such as gaskets or packing, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing

components be purchased from certain manufacturers that it had approved in advance. Those gaskets could have been manufactured by Garlock, Durabla or a number of other manufacturers that were listed in the QPL's by the U.S. Navy. To the extent that packing was used in these pumps, it could have been manufactured by John Crane or a number of other manufacturers that were listed in the QPL's by the U.S. Navy.

(2) Reciprocating Pumps – Reciprocating pumps use pistons to pump fluid. Most often these were auxiliary or emergency pumps manufactured for the bilges or to provide emergency feedwater to the boilers aboard U.S. Navy ships. For these pumps to withstand severe combat conditions, in Navy applications, the U.S. Navy required the use of certain component parts, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing components be purchased from certain manufacturers that it had approved in advance. For example, for pumps to withstand severe combat conditions, the U.S. Navy may have required that some of the packing and gaskets contained asbestos. In addition, the United States Navy specified the use of internal insulation, completely enclosed in a steel covering, which may have contained asbestos. However, Warren Pumps did not make such insulation, but had to buy it from a company approved by the U.S. Navy.

(3) Rotary or Screw Pumps – Rotary or Screw pumps simply use interlocking gears or a screw to push liquid through the pump. These pumps were generally used for more viscous materials. For these pumps to withstand severe combat conditions, in navy

applications, for example, the U.S. Navy required the use of certain component parts such as gaskets or packing, some of which may have contained asbestos. The U.S. Navy required that such asbestos-containing components be purchased from certain manufacturers that it had approved in advance. Those gaskets could have been manufactured by Garlock, Durabla, or a number of other manufacturers that were listed in the QPL's by the U.S. Navy. To the extent that packing was used in these pumps, it could have been manufactured by John Crane or a number of other manufacturers that were listed in the QPL's by the U.S. Navy.

Should plaintiff identify a particular time period, pump and location, Warren Pumps will endeavor to determine whether additional information exists.

20. With respect to each asbestos-containing product listed for each subpart of Interrogatory No. 19:

(a) Identify the specific company (Defendant, predecessor, related company) which designed, manufactured, processed, specified, sold, distributed, applied, installed, patented or re-labeled such product;

* * *

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

[illegible] to whom these presents shall come.. Greeting:

By virtue of the authority vested in me by the Archivist of the United States, I certify on his behalf, the seal of the National Archives of the United States, that the attached reproduction(s) is a true and correct copy of documents in his custody.

SIGNATURE /s/ Timothy K. Nenninger	
NAME Timothy K. Nenninger	DATE 10/14/52
TITLE Chief, Modern Military Records LICON	
NAME AND ADDRESS OF DEPOSITORY National Archives and Records Administration 8601 Adelphi Road College Park, MD 20740	

NA FORM 14007 (10–86)

MILITARY SPECIFICATION

INSULATION FELT, THERMAL, GLASS FIBER (FOR TEMPERATURES UP TO 1,200°F.)

This specification was approved by the Departments of the Army, the Navy, and the Air Force for use of procurement services of the respective Departments.

1. SCOPE

1.1 This specification covers glass fiber insulation felt for thermal control of machinery and equipment such as steam turbines, boilers, boiler feed pumps, etc., at temperature up to 1,200°F.

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

SS–C–466 —Cloth, Yarn, Thread, and Tape; Asbestos.

MILITARY

JAN–P–105 —Packaging and Packing for Overseas Shipment—Boxes, Wood, Cleated, Plywood.

JAN–P–106 —Packaging and Packing for Overseas Shipment—Boxes, Wood, Nailed.

MIL–B–107 —Boxes, Wood, Wire-bound (Overseas Type).

JAN–P–125 —Packaging and Packing for Overseas Shipment — Barrier-Materials, Waterproof, Flexible.

MIL–A–140 —Adhesive, Water–Resistant, Waterproof, Barrier–Material.

MIL–I–942 —Insulation Batt, Thermal, Fibrous Glass.

NAVY DEPARTMENT

General Specifications for Inspection of Material.

STANDARDS

MILITARY

MIL–STD–105— Sampling Procedures and Tables for Inspection by Attributes.

MIL–STD–129— Marking of Shipments.

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Qualification. —Glass fiber insulation furnished under this specification shall be a product which has been tested and has passed the qualification tests specified in section 4 (see 6.2).

3.2 Material and construction. —The material shall consist of staple glass fibers felted into rovings and woven or bound with wire inserted asbestos thread (type III of Spec. SS–C–466) to form a flexible blanket. The construction shall conform to that of the sample submitted for qualification.

3.3 Dimensions.

3.3.1 *Length*.—Unless otherwise specified in the contract or order, the insulation shall be furnished in rolls 50 feet in length.

3.3.2 *Width*.—Unless otherwise specified in the contract or order, width of roll shall be 60 inches. A tolerance in width of plus one–half inch and minus one–fourth inch will be permitted.

3.4 Thicknesses and weights.—The insulation shall be furnished in the thicknesses shown in table I, as specified (see 6.1), and shall vary not more than plus or minus 10 percent from the weight specified for the ordered thickness.

TABLE I.—*Thicknesses and weights*

Thickness	Thickness tolerance ±	Weight per square foot
Inches	Inch	Ounces
¾	⅛	9.0
1	⅛	12.0
1½	⅛	18.0

3.5 Fineness of fiber.—The diameter of the individual fibers shall average between 0.00030 and 0.00040. The maximum diameter of any fiber shall be not more than 0.00050 (see 4.6.3).

3.6 Resistance to vibration. —There shall be no sagging or settling of the insulation when subjected to the vibration test for a period of 100 hours (see 4.6.4).

3.7 Alkalinity.—The alkalinity of the finished material expressed as sodium oxide (Na_2O) shall not exceed 0.20 percent (see 4.6.5).

3.8 Fusing temperature.—The fusing temperature of the fibers shall be not less than 1300°F. (see 4.6.6).

3.9 Stability.—The insulation shall reveal no physical changes upon completion of the stability tests specified in 4.6.7.

3.10 Thermal conductivity.—Thermal conductivity (k) in B.t.u. per hour per square foot of insulation for 1°F. gradient per inch thickness shall not exceed the values at the mean temperatures shown in table II (see 4.6.8).

TABLE II.—*Thermal conductivity*

Mean temperature	Thermal conductivity (k)
Degrees F.	
100	0.32
300	.45
500	.56
700	.70

3.11 Workmanship. — The workmanship shall be first class in every respect.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Inspection procedures.—For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

4.2 Qualification tests at a Government laboratory. — Qualification tests shall be conducted at a Government laboratory designated by the Bureau of Ships. These tests shall consist of the tests specified in 4.6.

4.3 Sampling.

4.3.1 *Lot*.—For purposes of sampling a lot shall consist of not more than 25,000 square feet of glass fiber insulation felt of the same thickness offered for delivery at one time.

4.3.2 *Sampling for lot acceptance inspection and tests at the place of manufacture.*

4.3.2.1 *Sampling for lot acceptance inspection.*—A random sample of rolls shall be selected from each lot of material by the Government inspector with lot acceptance based on table III in accordance with Standard MIL–STD–105.

TABLE III.—*Sampling for inspection*

Number of rolls in inspection lot	Number of rolls in sample	Acceptance number (defectives)	Rejection number (defectives)
15 and under	5	0	1
16 to 40	7	0	1
41 to 65	10	0	1
66 to 110	15	1	2
Over 110	25	2	3

4.3.2.2 *Sampling for lot acceptance tests.*— From each lot the Government inspector shall select seven samples 12 by 60 inches at random for the tests specified in 4.5.1.

4.3.3 *Sampling for production check tests at a Government laboratory.*—From the first lot offered for delivery under a contract or order, and thereafter from one lot in each group of 15 successive lots of the same thickness, the Government inspector shall select two samples 36 by 36 inches at random. These samples shall be forwarded by the Government inspector to a Government laboratory designated by the bureau or agency concerned for testing in accordance with 4.5.2.

4.4 Inspection.—Each of the sample rolls selected in accordance with 4.3.2.1 shall be surface inspected, weighed, and measured to determine conformance with the requirements of this specification which do not require tests. Any roll in the sample containing one or more visual or dimensional defects shall be rejected, and if the number of defective rolls in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. Rejected lots may be offered again for Government inspection provided the contractor has removed all nonconforming rolls. The Government inspector shall again select and examine samples from such rejected lots to verify compliance with this specification.

4.5 Tests.

4.5.1 *Lot acceptance tests at place of manufacture.* — The samples selected in accordance with 4.3.2.2 shall be subjected to the tests specified in 4.6.1, 4.6.2, 4.6.3 and 4.6.6.

4.5.1.1 *Action in case of failure.*—If any one of the samples tested is found to be not in conformance with this specification, the lot which it represents shall be rejected. A rejected lot may be resubmitted for Government inspection only after the manufacturer, after being informed of the reasons for rejectance has so reworked the entire lot as to remove or correct all nonconforming material.

4.5.2 *Production check tests at a Government laboratory.*—The samples selected in accordance with 4.3.3 shall be forwarded to the Naval Engineering Experiment Station, Annapolis, Md. to be tested as specified in 4.6.3, 4.6.5 and 4.6.6. Tests of performance as specified in 4.6.4, 4.6.7 and 4.6.8 shall also be conducted as deemed necessary by the Laboratory.

4.5.2.1 *Action in case of failure.*—Acceptance of the first lot offered for delivery under a contract or order shall be withheld until a satisfactory report is received on the production check test sample. Thenceforth, except as hereinafter specified, acceptance and rejection of lots shall normally be on the basis of the sampling and inspection specified in 4.3.2.1 and 4.4, and acceptance shall not be withheld pending receipt of test reports on production check test samples. However, upon receipt of an unsatisfactory test report on a production check test sample, the Government inspector shall select additional samples from every subsequent lot offered for delivery. The samples so selected shall be submitted to United States Naval Engineering Experiment Station, Annapolis, Md., and shall there be subjected to test or tests wherein failure was observed. Lots shall then be accepted only upon receipt of a satisfactory test report on the samples so selected.

Additional testing shall be discontinued and lot acceptance returned to the normal basis when three successive lots have been accepted.

4.6 Test procedures.

4.6.1 *Thickness.*—The test specimen shall be ruled off into 10 approximately square and equal areas, and the thickness measurement taken at the center of each area. In determining the thicknesses, the test specimen shall be placed on a hard flat surface, and the penetrating pin of the depth gage shall be forced downward through the specimen, perpendicular to the flat surface as shown on figure 1. If necessary to prevent compression of the specimen by the depth–gage pin, the specimen shall first be pierced. When the point of the pin touches the flat surface, the sliding disk shall be lowered to the point of contact with the top surface of the specimen. The gage shall be withdrawn, and the distance from the point of the pin to the sliding disk shall be measured to the nearest 1/32–inch. The average of the 10 thickness measurements shall be taken as the thickness of the test specimen.

4.6.2 *Weight*.—Each sample roll selected in accordance with 4.3.2.1 shall be weighed on suitable scale to verify compliance with 3.4.

4.6.3 *Fineness of fibers*. — Diameter of fibers shall be determined microscopically on the basis of at least 7 checks on each of the samples. The average diameter for purposes of determining conformance with 3.5 shall be the average of all measurements on all samples; the maximum shall be the maximum diameter of any fiber thus measured.

4.6.4 *Resistance to vibration*.—The test for determining ability of the material to withstand vibration while subjected to a temperature of 1,200°F. shall be conducted on two 2–foot square, 2–inch thick sheets which shall be mounted on the faces of an electrical heater plate. The ends of the heater plate shall be insulated with cut sections of the material and the entire assembly shall be fitted and mounted within a 1/16–inch thick sheet–iron casing 30 by 30 by 6 inches. The casing shall be mounted in a vertical position on a vibration test apparatus. Five iron constantan thermocouples, equally spaced and secured in each face of the heater plate and the outer surfaces of the metal casing, shall afford a means of ascertaining the inner and the exposed temperature of the assembly. During the test the material shall be subjected to 720 vibrations per minute through an arc of 15 minutes for a period of 100 hours of operation. At the end of the 100–hour period of operation the outer metal casing of the assembly shall be removed and the condition of the sheets noted.

4.6.5 *Alkalinity*.—Weigh a 5 ± 0.01 gram (gm.) representative sample of the felt, and introduce into a

500 milliliter (ml.) pyrex Erlenmeyer flask. Wet with 5 ml. of 95 percent ethyl alcohol, and add 400 ml. of distilled water. Reflux for 4 hours ±5 minutes. At the end of this period, disconnect the condenser and filter at once through No. 41 Whatman paper supported in a Buechner funnel. Wash the flask and material three times with 25 ml. portions of hot distilled water using suction. Titrate immediately with 0.02 NH_2SO_4, using 6 to 8 drops of 1 percent solution of phenol–red indicator, to the disappearance of the pink color. Run a blank determination on the same amount of distilled water and alcohol and correct for any alkalinity shown. The percentage alkalinity as Na_2O is calculated from the following formula: percent Na_2O = 0.0124 (ml. H_2SO_4 used by sample minus ml. H_2SO_4 used by blank).

4.6.6 *Fusing temperature.* —Weigh 1 gm. of glass fiber into a crucible and place in a muffle furnace at room temperature. Turn all heating elements on at start of test and adjust so that the specified temperature of 1,300°F. is reached in 45 minutes. When this temperature is reached, remove crucible from furnace immediately, allow to cool, and examine visually for fusion. Fusion shall be said to have taken place if any part of the sample has melted and formed a homogenous mass.

4.6.7 *Stability.* —Samples of felt 4 inches square shall be encased in a metal wire screen and placed on a rack above the water level in a steam digester. The samples shall be subjected to saturated steam at 225 pounds per square inch (p.s.i.) gage for 1.6 hours. Samples shall then be removed, examined, and conditions noted.

4.6.8 *Thermal conductivity*.—Thermal conductivity shall be determined by the guarded hot plate method specified in Specification MIL–I–942.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 *For domestic shipment*.—The subject commodity shall be furnished in bales covered with standard 7½ ounce (weight) burlap tubing with tubing drawn together at each end with wire. The gross weight shall not exceed 200 pounds.

5.1.2 *For oversea shipment*.—The subject commodity shall be packed in cleated–ply-wood, nailed wood, or wirebound boxes conforming to Specification JAN–P–105, JAN–P–106, or MIL–B–107, respectively. Shipping containers shall be lined with a sealed waterproof bag or its equivalent, made from material conforming to Specification JAN–P–125, for case liners. The seams and closures shall be sealed with adhesive conforming to Specification MIL–A–140. The gross weight shall not exceed approximately 200 pounds.

5.1.3 *For domestic or oversea shipment*.— Where practicable, shipping containers shall be of uniform size, and shall contain the identical number of rolls. Containers shall be designed to fit the contents in a compact manner.

5.2 Marking. In addition to any special marking required by the contract or order shipping containers shall be marked in accordance with Standard MIL–STD–129.

6. NOTES

6.1 Ordering data. — Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Thickness of insulation required (see 3.4).

(c) Whether packing for domestic or oversea shipment is required (see 5.1).

6.2 In the Procurement of products requiring qualification the right is reserved to reject bids on products that have not been subjected to the required tests and found satisfactory for inclusion on the Military Qualified Products List. The attention of suppliers is called to this requirement, and manufacturers are urged to communicate with the Bureau of Ships, Navy Department, Washington 25, D.C., and arrange to have the products that they propose to offer to the Army, the Navy or the Air Force, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the Chief of the Bureau of Ships, Navy Department, Washington 25, D.C.

Notice. —When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Custodian:
Army – Corps of Engineers
Navy – Bureau of Ships
Air Force

Other interest:
Army – OT
Navy – SY.

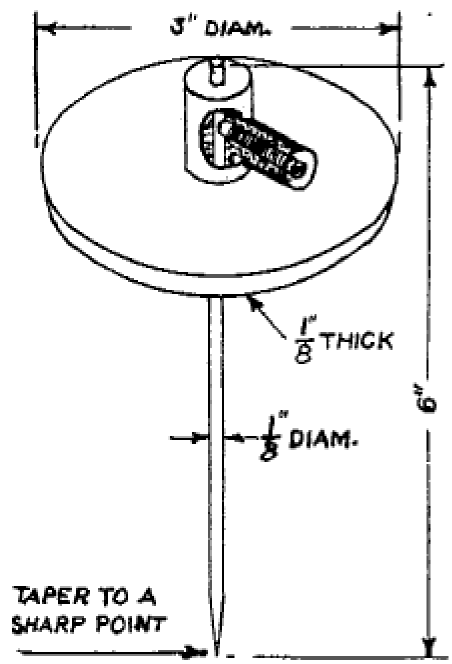

FIGURE 1.—*Depth gage for thickness measurements*

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