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 I OF II)

SHAY DVORETZKY
Counsel of Record
JONES DAY
51 Louisiana Ave NW
Washington, DC 20001
Tel.: (202) 879-3939
sdvoretzky@jonesday.com

Counsel for Petitioner CBS Corporation

RICHARD PHILLIPS MYERS
Counsel of Record
PAUL, REICH & MYERS
1608 Walnut Street, Suite 500
Philadelphia, PA 19103
Tel.: (215) 735-9200
rmyers@prmpclaw.com

Counsel for Respondents Roberta G. DeVries and Shirley McAffee

(Additional counsel listed on inside cover)

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

CARTER G. PHILLIPS
Counsel of Record
SIDLEY AUSTIN LLP
1501 K Street, N.W.
Washington, DC 20005
Tel.: (202) 736-8270
cphillips@sidley.com

Counsel for Respondent
General Electric Co.

(continued from front cover)

TABLE OF CONTENTS

Page

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

Page

TABLE OF CONTENTS
(continued)

Page

TABLE OF CONTENTS
(continued)

Page

TABLE OF CONTENTS
(continued)

Page

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

Page

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 16-2669

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	**Docket Text**
06/06/2016	CIVIL CASE DOCKETED. Notice filed by Appellant Shirley McAfee in District Court No. 5-13-cv-06856 and 2-01-md-00875. (DW) [Entered: 06/06/2016 02:43 PM] * * *
06/23/2016	CLERK ORDER The joint motion to consolidate the appeals at Nos. 16-2602 & 16-2669 is granted. The actions are consolidated for all purposes, filed. [16-2602, 16-2669] (CJG) [Entered: 06/23/2016 11:34 AM] * * *
10/03/2017	PRECEDENTIAL OPINION Coram: VANASKIE, SHWARTZ and RESTREPO, Circuit Judges. Total Pages: 19. Judge: VANASKIE Authoring. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:24 AM]
10/03/2017	JUDGMENT, Affirmed In Part as to Appellants' strict liability claims.

With respect to Appellants' negligence claims, the cases are Remanded to the District Court. Costs shall not be taxed. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:25 AM]
* * *

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 16-2602

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	**Docket Text**
5/31/2016	CIVIL CASE DOCKETED. Notice filed by Appellant Roberta G. Devries in District Court No. 5-13-cv-00474,2-01-md-00875. (CJG) [Entered: 05/31/2016 10:04 AM] * * *
06/23/2016	CLERK ORDER The joint motion to consolidate the appeals at Nos. 16-2602 & 16-2669 is granted. The actions are consolidated for all purposes, filed. [16-2602, 16-2669] (CJG) [Entered: 06/23/2016 11:34 AM] * * *
10/03/2017	PRECEDENTIAL OPINION Coram: VANASKIE, SHWARTZ and RESTREPO, Circuit Judges. Total Pages: 19. Judge: VANASKIE Authoring. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:24 AM]

10/03/2017	JUDGMENT, Affirmed In Part as to Appellants' strict liability claims. With respect to Appellants' negligence claims, the cases are Remanded to the District Court. Costs shall not be taxed. [16-2602, 16-2669] (CJG) [Entered: 10/03/2017 09:25 AM]

* * *

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 15-2667

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	Docket Text
07/16/2015	CIVIL CASE DOCKETED. Notice filed by Appellants Kenneth McAfee and Shirley McAfee in District Court No. 5-13-cv-06856 & 2-01-md-00875. (OM) [Entered: 07/16/2015 05:12 PM] * * *
11/16/2015	ECF FILER: ELECTRONIC BRIEF with Appendix Volume I on behalf of Appellants Kenneth McAfee and Shirley McAfee, filed. Certificate of Service dated 11/16/2015 by ECF. --[Edited 11/20/2015 by EAF - Text edited to indicate Appendix attached; Appendix Volume II removed and refied as of 11/20/15] (REP) [Entered: 11/16/2015 11:23 AM] * * *
11/20/2015	ECF FILER: ELECTRONIC APPENDIX VOLUME II on behalf of Appellants Kenneth McAfee and Shirley McAfee, filed. Certificate of service

	dated 11/20/2015 by ECF. --[Edited 11/20/2015 by EAF - Text edited to specify volume] (REP) [Entered: 11/20/2015 09:09 AM]
	* * *
05/12/2016	ORDER (VANASKIE, SHWARTZ and RESTREPO, Circuit Judges) Upon Consideration of the Arguments by Counsel Presented in their Briefs, It is Hereby Ordered that the Case is Summarily Remanded to the District Court to consider these items. In the event that a subsequent appeal is taken after the proceedings on remand have concluded, any future appeal will be considered by this panel after completion of briefing, filed. Judge: SHWARTZ Authoring, (See Order for Full Text). (PDB) [Entered: 05/12/2016 04:28 PM]
	* * *

GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

Court of Appeals Docket #: 15-1278

* * *

Appeal From: United States District Court for the Eastern District of Pennsylvania

* * *

In re: Asbestos Products Liability Litigation (No. VI)

Date Filed	Docket Text
2/12/2015	CIVIL CASE DOCKETED. Notice filed by Appellant Roberta G. Devries in District Court No. 5-13-cv-00474 and 2-01-md-00875. (ARR) [Entered: 02/12/2015 04:25 PM]
	* * *
06/09/2015	ECF FILER: ELECTRONIC BRIEF with Volume I of Appendix attached on behalf of Appellant Roberta G. Devries, filed. Certificate of Service dated 06/09/2015 by ECF. [Appendix Volumes II-VII were removed from this entry by the Clerk as they were re-filed separately]--[Edited 06/10/2015 by MS] (REP) [Entered: 06/09/2015 02:27 PM]
	* * *
06/09/2015	ECF FILER: ELECTRONIC APPENDIX on behalf of Appellant Roberta G. Devries, filed. Certificate of service dated 06/09/2015 by ECF. (REP) [Entered: 06/09/2015 04:02 PM]

* * *

08/10/2015	ECF FILER: JOINT SUPPLEMENTAL ELECTRONIC APPENDIX on behalf of Appellees Buffalo Pumps Inc, CBS Corp, Foster Wheeler LLC, GE Co, IMO Industries Inc and Warren Pumps, filed. Certificate of service dated 08/10/2015 by ECF.--[Edited 08/11/2015 by MCW] (PJS) [Entered: 08/10/2015 03:33 PM]
08/10/2015	ECF FILER: ELECTRONIC BRIEF on behalf of Appellee Foster Wheeler LLC, filed. Certificate of Service dated 08/10/2015 by ECF. (LJJ) [Entered: 08/10/2015 04:22 PM]

* * *

02/05/2016	ORDER (VANASKIE, SHWARTZ and RESTREPO, Circuit Judges), summarily remanding this case to the District Court to determine whether the District Court: (1) considered the negligence theory; (2) concluded that the bare metal defense applies to it and why, or (3) considered whether the circumstances listed in the case cited herein should apply to a negligence claim brought under maritime law (and if not, why not, and if so, why and whether the record here would support such a claim). In the event that a subsequent appeal is taken after

the proceedings on remand have concluded, any future appeal will be considered by this panel after completion of briefing, filed. Judge: SHWARTZ Authoring (ARR) [Entered: 02/05/2016 05:41 PM]

* * *

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF PENNSYLVANIA (ALLENTOWN)

CIVIL DOCKET FOR CASE # 5:13-cv-06856-GJP

MCAFEE, et al. v.
20TH CENTURY GLOVE CORP. OF TEXAS

* * *

Date Filed	#	Docket Text
11/25/2013	1	NOTICE OF REMOVAL by CBS CORPORATION, GENERAL ELECTRIC COMPANY from Philadelphia Common Pleas, case number 131000205. Certificate of Service.(Filing fee $ 400 receipt number 092116)(jwl,) (Entered: 11/26/2013) * * *
08/25/2014	171	First MOTION for Summary Judgment filed by INGERSOLL-RAND & CO..memorandum, certificate of service.(RYAN, DANIEL) (Entered: 08/25/2014) * * *
09/24/2014	203	RESPONSE to Motion re <u>171</u> First MOTION for Summary Judgment *of Ingersoll-Rand* filed by KENNETH E. MCAFEE. (Attachments: # <u>1</u> Exhibit, # <u>2</u> Exhibit)(PAUL,

		ROBERT) (Entered: 09/24/2014)
		* * *
10/23/2014	218	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT INGER-SOLL-RAND & CO. (DOC. NO. 171) IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/22/2014.10/27/2014 EN-TERED AND COPIES E-MAILED.(jmg,) (Entered: 10/27/2014)
		* * *
07/08/2015	275	NOTICE OF APPEAL by KEN-NETH E. MCAFEE. Copies to Judge, Clerk USCA, Appeals Clerk and (PAUL, ROBERT) Modified on 7/10/2015 (fb). (En-tered: 07/08/2015)
		* * *
05/26/2016	280	ORDER THAT THIS COURT REAFFIRMS IT 10/22/14 EN-TRY OF JUDGMENT AND DI-RECTS ANY INTERESTED PARTIES TO ITS REASON-ING SET FORTH IN ITS 5/19/16 EXPLANATORY OR-DER. SIGNED BY HONORA-BLE EDUARDO C. ROBRENO ON 5/25/16. 5/26/16 ENTERED AND COPIES E-

		MAILED.(mbh,) (Entered: 05/27/2016)
05/31/2016	281	NOTICE OF APPEAL by KENNETH E. MCAFEE. Fee Not Paid. Copies to Judge, Clerk USCA, Appeals Clerk.(PAUL, ROBERT) Modified on 5/31/2016 (fb). (Entered: 05/31/2016)
		* * *

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF PENNSYLVANIA (ALLENTOWN)

CIVIL DOCKET FOR CASE #: 5:13-cv-00474-ER

DEVRIES, et al. v. GENERAL ELECTRIC COMPANY et al.

* * *

Date Filed	#	Docket Text
01/25/2013	1	NOTICE OF REMOVAL by CBS CORPORATION, GENERAL ELECTRIC COMPANY from Philadelphia CCP, case number December 2012 No. 3661. (Filing fee $ 350 receipt number 075971), Certificate of Service.(tj,) (Additional attachment(s) added on 1/28/2013: # 1 Exhibits C-E) (tj,). (Entered: 01/28/2013) * * *
07/02/2013	168	AMENDED COMPLAINT with Certificate of Service against ALLEN-BRADLEY COMPANY, ALLEN-SHERMAN-HOFF, AMTICO, AURORA PUMP, AZROCK INDUSTRIES, INC., BELL & GOSSETT/DOMESTIC PUMP, BRYANT HEATING AND COOLING, BUFFALO PUMPS, INC., BURNHAM LLC, BW/IP, INC., CHICAGO

DRYER, CLEAVER BROOKS, INC., COPES VULCAN, CRANE CO., CROUSE-HINDS, DAL-TILE, DENISON INTERNATIONAL, DOVER CORPORATION, EDWARDS VALVE, ELLIOT GROUP U.S. HEADQUARTERS, FOSTER-WHEELER LLC, GARDNER-DENVER-JOY COMPRESSORS, GENERAL ELECTRIC COMPANY, GLASGOW, INC., GOODYEAR CANADA, GOODYEAR TIRE & RUBBER CO., GUARD LINE, INC., HAMPSHIRE INDUSTRIES, HARNISCHFEGER CORP., HENKLES AND MCCOY, INC., INSUL CORPORATION, J.A. SEXAUER, METROPOLITAN LIFE INS. CO., MINNESOTA MINING & MANUFACTURING, OWENS-ILLINOIS, INC., RILEY STOKER CORPORATION, SEPCO CORPORATION, UNITED CONVEYOR CORPORATION, UNIVERSAL REFRACTORIES, WARREN PUMPS, WEL MCLAIN, AMCHEM PRODUCTS, IMO INDUSTRIES, INC., filed by JOHN B. DEVRIES, ROBERTA G. DEVRIES.(ti,) Modified on

		7/3/2013 (ti,). (Entered: 07/03/2013)
		* * *
10/15/2013	263	MOTION for Summary Judgment filed by WARREN PUMPS.Memorandum, Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5Exhibit E, # 6 Exhibit F, # 7 Exhibit G)(SCHEETS, JOSHUA) (Entered: 10/15/2013)
		* * *
10/15/2013	269	MOTION for Summary Judgment filed by CBS CORPORATION.Memorandum, Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Errata B, # 3 Exhibit C, # 4 Exhibit D, # 5Exhibit E)(MCSHEA, JOHN) (Entered: 10/15/2013)
10/15/2013	270	MOTION for Summary Judgment filed by GENERAL ELECTRIC COMPANY.Memorandum, Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4Exhibit D)(MCSHEA, JOHN) (Entered: 10/15/2013)
		* * *
10/15/2013	273	MOTION for Summary Judgment filed by IMO INDUS-

		TRIES, INC..Memoradum, Certificate of Service.(FONTAK, JOSEPH) (Entered: 10/15/2013)
10/15/2013	274	MOTION for Summary Judgment filed by BUFFALO PUMPS, INC..Memorandum, Certificate of Service.(HOWARTH, JOHN) (Entered: 10/15/2013)
		* * *
10/15/2013	277	MOTION for Summary Judgment filed by FOSTER-WHEELER LLC.Memorandum of Law in Support of Motion for Summary Judgment and Certificate of Service. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13Exhibit M, # 14 Exhibit N)(JANICZEK, LEROY) (Entered: 10/15/2013)
		* * *
11/15/2013	291	RESPONSE to Motion re 277 MOTION for Summary Judgment *of Foster Wheeler* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5, # 5 part 6,

		# 6 part 7, # 7 part 8)(PAUL, ROBERT) (Entered: 11/15/2013)
		* * *
11/15/2013	294	RESPONSE to Motion re 270 MOTION for Summary Judgment *of General Electric* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5, # 5 part 6)(PAUL, ROBERT) (Entered: 11/15/2013)
11/15/2013	295	RESPONSE in Opposition re 270 MOTION for Summary Judgment *of Plaintiffs* filed by GENERAL ELECTRIC COMPANY. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D)(MCSHEA, JOHN) (Entered: 11/15/2013)
11/15/2013	296	RESPONSE to Motion re 269 MOTION for Summary Judgment *of CBS Corporation* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5, # 5 part 6, # 6 part 7)(PAUL, ROBERT) (Entered: 11/15/2013)
11/15/2013	297	RESPONSE to Motion re 273 MOTION for Summary

		Judgment *to IMO* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2)(PAUL, ROBERT) (Entered: 11/15/2013)
11/15/2013	298	RESPONSE to Motion re 274 MOTION for Summary Judgment *of Buffalo Pumps* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4, # 4 part 5)(PAUL, ROBERT) (Entered: 11/15/2013) * * *
11/15/2013	301	RESPONSE to Motion re 263 MOTION for Summary Judgment *to Warren Pumps* filed by JOHN B. DEVRIES. (Attachments: # 1 part 2, # 2 part 3, # 3 part 4)(PAUL, ROBERT) (Entered: 11/15/2013) * * *
10/06/2014	345	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT WARREN PUMPS (DOC. NO. 263) IS GRANTED. ETC. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/1/14. 10/6/14 ENTERED AND COPIES E-MAILED.(va,) (Entered: 10/06/2014)
10/06/2014	346	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT

		OF DEFENDANT IMO INDUSTRIES, INC. (DOC. NO. 273) IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/1/14. 10/6/14 ENTERED AND COPIES E-MAILED.(va,) (Entered: 10/06/2014)
10/06/2014	347	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT BUFFALO PUMPS, INC. (DOC. NO. 274) IS GRANTED. ETC. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/01/2014. 10/06/2014 ENTERED AND COPIES E-MAILED. (va,) (Entered: 10/06/2014) * * *
10/15/2014	350	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT CBS CORPORATION IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/10/2014.10/15/2014 ENTERED AND COPIES E-MAILED.(uh,) (Entered: 10/15/2014)
10/15/2014	351	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT GENERAL ELECTRIC COMPANY IS

		GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/10/2014.10/15/2014 ENTERED AND COPIES E-MAILED.(uh,) (Entered: 10/15/2014) * * *
10/15/2014	353	ORDER THAT THE MOTION FOR SUMMARY JUDGMENT OF DEFENDANT FOSTER WHEELER LLC IS GRANTED. SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 10/10/2014.10/15/2014 ENTERED AND COPIES E-MAILED.(uh,) (Entered: 10/15/2014) * * *
01/26/2015	364	NOTICE OF APPEAL by JOHN B. DEVRIES. Copies to Judge, Clerk USCA, Appeals Clerk (Entered: 01/26/2015)
01/26/2015	365	Clerk's Notice to USCA re 364 Notice of Appeal : (ti,) (Entered: 01/28/2015) * * *
02/12/2015		USCA Case Number 15-1278 for 364 Notice of Appeal filed by JOHN B. DEVRIES. (ahf) (Entered: 02/13/2015) * * *

03/03/2016	368	ORDER of USCA as to 364 Notice of Appeal filed by JOHN B. DEVRIES THAT THE CASE IS SUMMARILY REMANDED TO THE DISTRICT COURT TO CONSIDER THESE ITEMS; ETC. (ems) (Entered: 03/03/2016)
05/19/2016	369	MEMORANDUM AND/OR OPINION SIGNED BY HONORABLE EDUARDO C. ROBRENO ON 5/18/16. 5/19/16 ENTERED AND COPIES MAILED, E-MAILED.(ti,) (Entered: 05/19/2016) * * *
05/23/2016	371	NOTICE OF APPEAL by JOHN B. DEVRIES; no filing fee paid. Copies to Judge, Clerk USCA, and Appeals Clerk. (ti,) Modified on 5/24/2016 (ti,). (Entered: 05/24/2016) * * *

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF PENNSYLVANIA

In Re: Asbestos Product	)	Civil Action No.
Liability Litigation	)	MDL 875
	)	
All Actions	)	

AFFIDAVIT OF ROGER B. HORNE JR.
RADM USN (RET)

1. I am a retired Rear Admiral of the United States Navy, in which I served between 1956 and 1991. I began my Navy Career in 1956, immediately after receiving a Bachelor of Science degree in Naval Engineering from the Unites States Naval Academy at Annapolis, Maryland. I have also received extensive post-graduate education in naval engineering, including a Master of Science Degree in Mechanical Engineering from the U.S. Naval Postgraduate School, and have taught Naval Engineering as a Visiting Professor at the University of Michigan. Throughout my Navy career, I concentrated in areas of ship design, engineering, construction, overhaul and inspection. Ultimately, I achieved the rank of Chief Engineer and Deputy Commander, Naval Sea Systems Command ("NAVSEA") for Ship Design and Ship Systems Engineering. Prior to that, I served as Deputy Commander, NAVSEA for Facilities and Industrial Management; Commander, Puget Sound Naval Shipyard; Commander, Engineering Duty Officer School; Production and Repair Officer, Mare Island Naval Shipyard; Nuclear Engineering Manager, Puget Sound Naval Ship-

yard; Nuclear Submarine Inspection Officer, Supervisor of Shipbuilding Office, Ingalls Shipyard and Chief Engineer in the USS Ozbourn (DD 846).

I have been involved in the construction or overhaul of over 80 ships and submarines and served at sea. I am proud that these vessels have performed many activities vital to the national defense. Examples of these activities during my tenure include at sea task force operations following the Korean war while doing joint operations with ships of the Southeast Asia Treaty Organization ("SEATO"); shipyard positions including command with significant responsibilities concerning vessels with vital missions during the Cold War and Viet Nam war, as well as, senior positions later in my career with significant responsibility concerning the overall management of industrial facilities in both private and public shipyards as well as the design of new ships.

2. While in the Navy, I was recognized for achievements in the field of marine machinery and engineering, and I have received three National Legion of Merit Awards and three Meritorious Service Awards for Engineering and Industrial Achievement and an award from the Marine Machinery Association.

3. In addition to my training and experience in Navy ship construction as outlined above, upon retirement, I taught part-time at the University of Michigan as a visiting professor in ship construction. Further, in civilian life, I had responsibility for the Marine and Aviation Section at Failure Analysis Associates located in Menlo Park California. On retirement from Failure Analysis Associates I have been involved with many asbestos related legal cases. Exhibit 1 is a true, complete and correct copy of my curriculum vitae.

4. Based on my naval experience and training, general knowledge and review of the materials supplied me, I submit this Affidavit to attest to (a) the Navy's mission and the relevance of equipment design, engineering, construction, repair, overhaul and inspection to that mission; (b) the centrality of equipment and materials such as propulsion turbines, turbine-generator sets and related equipment ("turbines") and asbestos thermal insulation to the Navy's ability to successfully wage wars in the 20th Century; and (c) the importance of Navy designed and Navy controlled asbestos warning procedures.

5. Stated simply, the mission of the Navy is to win wars, deter aggression and maintain freedom of the seas. In the interests of the national defense, the Navy has four primary areas of responsibility concerning ships and submarines: (1) the design and construction of naval forces necessary for effective prosecution of national defense; (2) the maintenance of naval ships and equipment essential to readiness for naval operations; (3) the development of new equipment and weapon systems; and (4) support for its sailors.

6. The country requires a Navy with offensive capability that can project power to discourage aggressive action by other nations. There is never a time when the Navy is not either engaged in combat or preparing for combat by readying its primary war weapons – ships and sailors – for battle. Even in times of "peace" (when the Country is not officially at war or when ships are not engaged in combat), the Navy provides important combat-related services. For example, Navy submarines patrolling international waters have been credited with assisting in the collapse of Soviet Russia during the nuclear arms race between the

United States and Russia commonly referred to as the Cold War.

7. Retaining a trained base of personnel, continually introducing state-of-the-art equipment and materials, and keeping in good repair its ships, aircraft and auxiliary equipment are essential, inextricable aspects of the Navy's national responsibilities. For this reason, the Navy's effort to design, engineer, construct, repair, and inspect its ships, aircraft and auxiliary vessels, whether during operations or in shipyards, was and is critical to the Navy's mission. Without continual training of personnel and construction and repair of its ships and auxiliary equipment, the Navy would not be capable of deterring aggression and fighting wars.

8. The Navy has a chain of command which establishes reporting authority from junior to senior officers and provides for the communication of instruction and orders among Navy personnel. To ensure that all Navy personnel know and understand the chain of command, enlisted personnel are taught it in boot camp and officers learn about it in the Naval Academy and other schools and college programs. This chain of command is crucial to mission success because it provides a single, uniform and effective method of communication. The Navy's chain of command enables the Navy to effectively organize its sailors and prepare them to respond to combat situations and perform a variety of strategic operations at a moment's notice. Obviously discipline is a key element supporting the Navy's mission. Personnel at all levels must be relied upon to carry out the lawful orders of their senior officers. Failure to have this ingrained in

the Navy culture would lead to chaos and mission failure in battle.

9. The Navy chain of command concerning ship construction involves several layers of authority related to technical and contractual control over Navy shipbuilding. The Secretary of the Navy has ultimate authority over the Navy and Navy shipbuilding; immediately below the Secretary, as has been the case since the creation of NAVSEA is the Chief of Naval Operations ("CNO") to whom NAVSEA reports. Prior to the establishment of NAVSEA, the Bureau of Ships ("BUSHIPS") controlled all combat ship design and construction and reported to the CNO as well as a civilian Assistant Secretary of the Navy. Since the creation of NAVSEA, NAVSEA reports to the CNO for all military ship design and construction.

10. The CNO is the top military official in the Navy. The CNO has lead responsibility for all matters of strategy, tactics and operations. Typically, the CNO will identify a threat or a special need, and NAVSEA will design ships and equipment to address the CNO's requirement. Designing a new ship is complex and involves the coordination of many engineering disciplines knowledgeable in the technical state-of-the-art in their individual professional areas. It is easy to understand Navy ships must satisfy a variety of missions and, although some ships can carry out multiple missions, there will be a need for a variety of ships with different designs. Generally the need for ships with specific mission capability will be conveyed to the NAVSEA by the CNO. NAVSEA will respond with concept designs. From this phase NAVSEA will go through a series of design iterations ("design spiral") in coordination with the CNO's staff until finally

a detailed and a contract design is reached for the ship. The design will set the needs for turbines along with other equipment and weapon systems. The Navy has its own engineers who specialize in turbines (machinery experts) and who are familiar with the state of the art for commercial turbines. The Navy's machinery experts do not actually design turbines themselves, but they use their expertise to develop a turbine design concept that contemplates emerging technology and new materials, as well as military tactical needs. Once a turbine design concept has been established, the Navy's machinery experts will consult with commercial turbine manufacturers concerning their turbine concept. Through a complex, iterative process the Navy works closely with turbine manufacturers to attain an ultimate turbine design that meets its new military requirements. The Navy will use previously developed military specifications ("MilSpecs"), create any additional specifications that may be required, and then issue a request for bids from qualified contractors in an effort to identify a contractor with the capability and capacity to create a design and to manufacture a turbine that satisfies its new military requirements.

11. The design of turbines and development of turbine military specifications are essential aspects of the Navy's shipbuilding program. These designs and specifications are built on the totality of the Navy's experience in fighting and planning for wars – what works, what is reliable, operation cycles, maintenance problems, and a multitude of other factors uniquely related to combat conditions. The ultimate design and military specifications for turbines developed by the

Navy reflect the existing state-of-the-art and demonstrate the Navy's operational experience in a variety of circumstances. They reflect the turbine design characteristics that directly impact the combat effectiveness of Navy ships and include among many other attributes the following:

a. Reliability: Turbines must be designed so that they are efficient and provide reliable power to enable the ships to travel long distances over extended periods without undue maintenance.

b. Quietness: Turbines aboard surface ships and, particularly, submarines must operate quietly to help protect the ships from enemy detection.

c. "Battle" Hardness: Turbines must be able to withstand the substantial shock sometimes experienced in battle. Material selection under shock requirements often dictates the use of special materials not found in commercial turbines.

d. Maintainability: Turbines must be designed so that they can be easily maintained at sea and require infrequent repair and overhaul. Turbines also must be designed so that they are compatible with standardized, replacement parts (consumable items) carried in the Navy's stock system.

12. Further, regarding the Navy's organization for controlling material as well as ship construction and maintenance, under the command of NAVSEA (as was the case with BUSHIPS) the Navy's shipbuilding structure is comprised of several divisions and levels of authority concerning equipment design, construction, repair and inspection. The Commander of Naval

Sea Systems and the Commander of Naval Supply direct technical and contractual control over shipboard construction, as ·well as, equipment and material. Both organizations have oversight responsibility concerning, among other things, equipment built for Navy vessels, as well as, the Navy vessel itself. Compliance with the standards and specifications required for ships and equipment built for Navy use was and is directly monitored by Naval Machinery Inspectors (some specializing in turbines) under both of these divisions. The Naval Machinery Inspectors are responsible to the Head of the Inspection Department for assuring that contractors follow the required military specifications as they relate to naval machinery. Further, the Naval Machinery Inspectors report to their superiors any violations or failures to comply with specifications.

13. At times the machinery inspectors under Naval Supply have worked on-site at the vendors' manufacturing facility for equipment, and the Supervisor of Shipbuilding (reporting to BUSHIPS) had Navy inspectors that carried out their inspection and contractual responsibilities at the shipbuilding yards. At one time in my career, the offices of the Supervisor of Shipbuilding reported to me for administration of the contracts for which they were responsible. Inspectors within the Supervisor of Shipbuilding offices would report to their superiors any violations or failures to comply with specifications.

14. Whether aboard ship or in a shipyard, the Navy Commander is the ultimate authority in all things related to the ship's operation or ship's construction, repair and overhaul, including instructions

that might impact the health and safety of Navy sailors or civilian workers engaged in these activities. The role of civilians both in Navy yards and in private yards was to carry out work in accordance with military specifications. At a Navy Yard, the Navy itself was directly involved in assuring the specifications are followed because everyone in a Navy yard is either an officer or a government contract worker. In a private yard, the Navy would have a local office of the Supervisor of Shipbuilding staffed, with Navy officers who are responsible for supervising all civilian activities and for inspecting and verifying purchasing documents and receiving equipment and material to ensure the ship construction and repair in the private yard conforms to Navy specifications. The Supervisor has to follow the requirements specified or get formal waivers to the specifications of interest from BUSHIPS. Through these means, the Navy has assurance that its ships meet the rigorous requirements of wartime vessels.

15. The attached exhibits illustrate the organizational lines of command for technical and contractual control over Navy shipbuilding. (*See* Exhibits 2 and 3). For a description of the responsibilities of each of the parties reflected on the attached organizational charts, refer to Exhibit 4, a document I prepared which describes in detail each individual's authority and responsibilities and explains how each level of command interrelates in the collective Navy effort to design, build and maintain our Navy fleet. In addition, this description identifies the several federal officers who exercised control over equipment manufacturers, including Westinghouse Electric Corporation ("Westinghouse") and General Electric Company ("GE"),

whenever they built and supplied turbines to the Navy during the past 50 or 60 years.

16. As noted, turbines built for Navy vessels, including Westinghouse and GE turbines, were manufactured according to plans and specifications prepared, written and issued exclusively by the Navy, specifically NAVSEA or BUSHIPS. This is my experience having served as Chief Engineer and Deputy Commander for NAVSEA's Ship Design and Engineering Division. I was responsible to the Commander of NAVSEA for developing ship designs and for overall technical support to the operating fleet, maintenance of ships, and ships under construction. Additionally, I was responsible for the maintenance of Navy ship military specifications and for monitoring compliance with the specifications by all vendors and contractors of Navy equipment.

17. The MilSpecs for Navy equipment were drafted, approved and maintained by the Navy, specifically NAVSEA, to address shipboard equipment and materials requirements, and any changes to those specifications were made by the Navy. NAVSEA maintained and controlled the MilSpecs largely because it had superior knowledge of the demands and requirements of combat-ready vessels. NAVSEA or BUSHIPS also prepared contract specifications which incorporated the MilSpecs. These specifications reflected the state-of-the-art and the special needs of combat and combat support vessels destined to deter or engage in war.

18. The specifications were communicated to Westinghouse, GE and other similar vendors when the Navy issued its Request for Proposal for certain equipment. Attached hereto as Exhibit 5 is a brief

summary of Navy Ship Design and Naval Machinery Military Specifications, as well as a brief summary of the Navy Ship Design/Construction Procedures, which explains how the Navy's machinery vendors were governed by the Navy's specifications.

19. An illustration of the control the Navy exercised over production of its turbines is the process by which turbines were made for the *U.S.S Kitty Hawk*, a Navy aircraft carrier. Examples of the specifications which applied to shipboard equipment for the *U.S.S. Kitty Hawk* are attached hereto as Exhibits 6 and 7. Exhibit 6 is an excerpt of a Military Specification concerning Turbine, Steam and General Auxiliary equipment (Naval Shipboard Use) identified as MIL-T-I7523A (SHIPS) dated 1 August 1955. Exhibit 7 is Bureau of Ships Contract Specification for Generator Set, Steam Turbine, also identified as "SHIPS-G-1956" dated 25 April 1955. Exhibit 8, attached hereto, is a copy of Westinghouse's purchase order for the turbines for the *Kitty Hawk*. This is evident based on the following information: the reference on page l of Exhibit 8 to "CVA 63" is to the ship number assigned by the Navy to the *Kitty Hawk* (CVA indicates it is an aircraft carrier, and 63 is this carrier's number). The Customer Order No. "NOBS-67530" is a reference to the Navy's contract number, i.e. the contract issued by BUSHIPS to Westinghouse to build the equipment described on page l of Exhibit 8. On page 4 of Exhibit 8, there is a reference to "Bureau of Ships Contract Specification SHIPS-G-1956, dated 25 April 1955," which is Exhibit 7. On page 2 of Exhibit 8 is a reference to "MIL-T-17523," which is Exhibit 6, the military specification described above. These documents mean that the Navy ordered from Westinghouse the turbine

equipment described in Exhibit 8, which incorporates the specifications in Exhibits 6 and 7, for use aboard the *U.S.S. Kitty Hawk*. As referenced throughout Exhibit 8, Westinghouse was to perform its work under control of the Navy: e.g. "Inspection: At Contractor's Plant, Essington, Pennsylvania, By the Inspector of Machinery, USN, Essington, Pennsylvania, except Item 2 shall be inspected . . . by the Assistant Inspector of Naval Material, East Pittsburgh, Pennsylvania" (Nme #4, p. 3); "Engineering service shall be performed . . . as directed by the Chief, Bureau of Ships or his duly authorized representative" (p. 4); "Contractor agrees to enter into a standard government contract . . . from the Bureau of Ships or Department of the Navy" (p. 5); "Contractor shall furnish the services of competent engineer(s) . . . as directed by the Chief, Bureau of Ships, or his duly authorized representatives." (Item 7, p. 5.)

20. As illustrated by the *Kitty Hawk* documents, all Navy vessel equipment, including Westinghouse and GE turbines, was built according to Navy specifications and approved for installation aboard these vessels exclusively by the Navy and its designated officers.

21. It should be easy to understand, and it is my experience, that the Navy retained the "final say" over the design attributes of naval ships and their equipment. As the purchaser, and having the engineering expertise and experience as to what was needed for naval combat vessels, the Navy retained final responsibility for the ultimate decision regarding how to resolve any disagreement between the Navy and a shipbuilder or an outside equipment supplier. In the case of private yards the Supervisor of Shipbuilding Office

provided the link between the shipbuilder and BUSHIPS in settling any disputes over Navy requirements. If Navy specifications were not followed by the shipbuilder the Supervisor's inspectors would reject the shipbuilder's involved work. All such disputes were handled formally and any changes required change orders to the contract or formal waivers to the specifications.

22. Considering the above, any and all work performed in the construction and repair of Navy ships noted in this case, as well as, the equipment built and supplied for these vessels was performed to combat requirements developed and specified by the Navy. Further, such work was typically reviewed and inspected by Navy personnel in the vendors' plants and in shipbuilding and repair yards. Such rigid conformance to requirements was absolutely necessary for the construction of a warship which was to take our sailors in harm's way.

23. The military specifications for turbines ensured that each and every turbine ordered by the Navy, regardless of the identity of the specific contract manufacturer, was uniform, complied with the Navy's combat requirements and would operate in the manner demanded by the Navy. This uniformity was critical because the Navy cannot take a ship into battle unless it knows that each component of the ship will satisfy precisely its specifications including those for reliability, quietness, battle hardness and maintainability. These characteristics are vital in total to the success of the ship's mission. The Navy cannot put a ship into harm's way and have it "dead in the "water" due to a limitation in its 'turbines' capabilities. The consequences of such problems — which can include

death, loss of ship or mission failure — are unacceptable to the Navy. Certainly the ship's propulsion plant, including turbines, are as important as the ships' weapons during combat.

24. Based on my experience and knowledge, the Navy required that all turbines be delivered "bare metal," meaning that the turbines were not to be accompanied by any type of insulation at the time of delivery. Pursuant to Navy military specifications, the turbines were designed by the Navy to include only metal rails and hooks, the means through which insulation could be attached. It would not have been possible for contract manufacturers to deliver turbines to the Navy without these rails and hooks because such turbines would not conform to military specifications. Moreover, the Navy did not permit individual turbine manufacturers to insulate their equipment prior to installation because it was more economical, efficient and allowed preoperational inspection and testing to have the ship's entire plant insulated at one time than to have each piece of equipment come with its own insulation. Additionally, the Navy was concerned that pre-installed insulation on turbines could be easily damaged during shipment.

25 It was the Navy, not contract manufacturers, that required the use of asbestos thermal insulation with turbines intended for installation on Navy ships. The Navy had its own engineers with expertise in insulation and heat transfer. These engineers developed their own plans and standards for the insulation of Navy equipment and, with respect to turbine insulation, these Navy engineers determined that asbestos thermal insulation best met the Navy's military

requirements. Asbestos thermal insulation had characteristics that were essential to the proper operation of turbines on Navy ships including: optimum heat retention, low weight, fire resistance, resistance to water damage and insect infestation, and cost-efficiency. Weight, in particular, was a significant factor in the Navy's determination to use asbestos insulation. Although specific amounts varied according to the particular class of ship and propulsion plant design at issue, in general, Navy destroyers overall required approximately 22 tons of asbestos thermal insulation and Navy aircraft carriers as much 300 tons of asbestos thermal insulation. Because asbestos had all of the characteristics critical to insulation on a Navy ship, the Navy had difficulty identifying satisfactory substitutes. Until acceptable substitutes were identified by the Navy beginning in the late-1970s, asbestos thermal insulation was critical to naval ship design and operation. Without proper insulation of the ship's propulsion plant (including turbines, boilers and auxiliary equipment), the ship's plant would be inefficient due to loss of heat and sailors would be burned or unable to operate in engineering spaces due to heat levels. Also, every pound of heavier insulation would displace the amount of weapons or fuel that could be placed aboard ship. For these reasons, Navy specifications demanded the use of asbestos thermal insulation with its turbines and auxiliary equipment for most of the 20th Century. If not for the presence of asbestos thermal insulation, the ship's efficiency would not allow it to operate properly including in combat.

26. In pursuing competitive bids from equipment vendors such as turbine manufacturers or asbestos

suppliers, cost was never the only or over-riding factor in equipment and material selection. All essential equipment placed aboard a Navy ship, including turbines and asbestos thermal insulation, had to meet the requirements of a ship intended to be placed in harm's way.

27. There is no way to battle harden a ship to the extent that no losses to personnel or equipment are ever sustained. For this reason, the Navy continually evaluated the combat benefits of specified equipment and materials against the potential risk to the health and safety of Navy personnel and civilian workers. Under the Navy's command structure, the responsibility for health and safety fell under separate divisions. The CNO was responsible for, and concerned with, issues seen as immediate threats to safety, and the Bureau of Medicine (BUMED) was responsible for medical treatment and issues related to long-term health hazards. The CNO and BUMED and their staffs communicate and coordinate on health issues. At times Navy personnel have to operate in harms way, and the Navy has to use the best material available to that end and control with procedures some health risks if necessary to fulfill its mission. For most of the 20th Century, it is clear that the Navy considered turbines to be "vital" to its combat mission (*see* MIL-T-17600A (SHIPS)) and that asbestos thermal insulation was essential to safe and efficient operation of its ships (*see* Bureau of Ships Manual, Ch. 39, Thermal Insulation (Aug. 24, 1945, Sec. 39-2).

28. The Navy has been aware of the health risk of exposure to asbestos dust since at least the 1920s. Until 1975, when it issued a policy aimed at eliminating the use of asbestos materials where possible, the

Navy believed that it had instituted adequate controls to protect personnel working with or around asbestos materials. However, even as the Navy moved toward elimination of asbestos materials in the late 1970s, the Navy could not immediately eliminate all asbestos and had to place additional measures believed to be necessary to control the health risks understood at the time. Capital steam driven ships had many tons of insulation and to immediately implement a program of total asbestos removal would immobilize the Navy for a lengthy period. Further, replacement material meeting the Navy's stringent military specifications was not available. Rather, the Navy instituted a careful and deliberate asbestos removal program that continued to protect personnel health to the greatest extent possible in light of operational demands including cost concerns. This program provided for replacing asbestos-containing insulation with non-asbestos insulation when repairs were required; leaving in place fixed or intact asbestos-containing insulation but painting the insulation (magenta with a white overlay) to identify the presence of potentially hazardous asbestos materials to workers; continuing to use existing stocks of asbestos-containing insulation in the Navy supply system; and continuing to accept new ships delivered with asbestos-containing insulation into the late 1970s, when a transition could be made commensurate with material availability and ship construction schedules.

29. The Navy's military specifications, which were enforced through the Navy's command structure, were designed to provide clear, concise, directions to all Navy personnel and civilian contractors working

under Navy direction. Not only did military specifications describe the physical equipment and material to be used in Navy ships but they also addressed the instructions considered essential by the Navy to warn individuals working with that equipment and material about potential hazards. For example, military specifications included directions for the painting and labeling of ship systems and equipment as well as the content of instruction manuals to be used in the operation and maintenance of equipment.

30. Military Specifications for technical manuals (MIL 15071) prior to 1957 did not mention warnings. Even when later revisions of the specification did mention warnings (Mil - M- l5071C of 10 Sep. 1957), it was the Navy's intent to include only warnings concerning how someone might be immediately physically injured by their actions or cause serious damage to equipment. It was also specifically noted that such warnings were to be used sparingly as was consistent with real need. These instructions were universally understood by the Navy not to include long-term health hazards such as those presented by asbestos. Even after the hazard of asbestos was more fully understood by the Navy beginning in the mid to late 1960s, the Navy did not require changes to the technical manuals. Instead, the Navy invoked effective internal instructions for the safe handling of asbestos. The Navy had final say, approved the content of technical manuals and had state-of-the-art medical understanding of the dangers of asbestos. Clearly if the Navy thought it necessary it could have required a warning concerning asbestos.

31. Further, the Navy controlled labeling that went on all equipment and materials. It should be

noted that, even with increased knowledge concerning asbestos after the mid to late l960's, the Navy did not require everything containing or associated with asbestos materials to be labeled as hazardous. In addition to the asbestos thermal insulation used in a ship's plant (turbines, boilers and auxiliary equipment), there were miles and miles of insulated pipe and cable; hundreds, if not thousands, of valves; and other equipment that involved asbestos in some way. Once the additional hazard of asbestos was understood, the Navy developed procedures to control work involving asbestos and to monitor exposure to asbestos dust while, at the same time, seeking and testing new materials to be used.

32. I served in shipyards before and after the Navy's internal asbestos control instructions came out, and was in ships under construction and overhaul daily for many years. It is my opinion that the military specifications and naval instructions were effective in controlling the asbestos hazard while maintaining the benefits associated with asbestos insulation. Labeling of systems or components containing asbestos, even with the Navy's increased understanding of the hazards, was not considered practical for combat and combat support operations and, therefore, was not directed or allowed by the Navy. Instead, the Navy chose to control and make personnel aware of the hazards of asbestos exposures through the strict, effective, procedures required by military specifications and personnel training.

33. In summary, the Navy exercised rigid control over the design, manufacture and installation of essential plant equipment and materials, such as turbines and asbestos insulations, to ensure that this

equipment and material would perform as expected during battle conditions. The Navy also developed and imposed requirements for warnings and documentation necessary for the maintenance of this equipment and material to ensure that personnel, particularly in combat conditions, received only one clear set of instructions that had been approved by the chain of command. Finally the Navy had in place a formal organization at building and repair facilities, and also available to inspect at supplier's plants, in order to assure its combat requirements were met.

34. I can attest that any and all work performed on turbines built and supplied for Navy ships by vendors such as Westinghouse and GE was performed to the requirements specified by the Navy and that the work was reviewed and inspected by Navy personnel in the vendor's plant and in the shipbuilding yards to ensure that the turbines met the Navy's combat needs. As noted earlier, in many instances during my career I personally inspected equipment to verify conformance with the requirements specified, although more immediate supervision typically was exercised by officers and other Navy personnel under my command or the command of NAVSEA or its predecessor, BUSHIPS.

35. Further in summary, I have general knowledge and extensive Navy experience with the comprehensive plans, specifications and requirements that governed the construction of Navy ships and the equipment placed on them. At one time, the engineers that prepared specifications and accomplished ship designs worked under me at NAVSEA. The Navy had general specifications and detailed specifications, as

well as, plans that were invoked by contract. The general and detailed specifications and contract plans also invoked more detailed specifications for the ship design, as well as, for the equipment and material to be used in its construction. Frequently, the more detailed specifications and contract plans noted above would invoke even further specifications so that a shipbuilder had to comply in all aspects of the construction. Such direction also included material referenced in the plans and stocked by the Navy. The Navy developed detailed requirements for the construction, maintenance and operation of warships and auxiliaries in order to ensure the ship's continued ability to operate in combat zones and be maintained with material specified and stocked by the Navy. Adherence to the Navy's specifications was mandatory because lives depended on it.

36. I have extensive experience and knowledge concerning the control exercised by the Navy during the construction, repair and overhaul of ships in Navy yards and private yards. Later in my career, all the Supervisor of Shipbuilding Offices inspecting Navy ships and other contracts reported to me (15 offices nationwide). I have personally inspected ships and equipment during construction, repair or overhaul, to verify conformance with the requirements specified and have given instructions to Navy employed inspectors as to how inspections were to be made. At times I and my inspectors have rejected items that failed to meet specifications. For example, I recall rejecting various piping integrity systems (including valves and gaskets) for failure to meet specifications because they proved to leak during system hydrostatic tests. In another case, testing during sea trials revealed a turbine

bearing leaked oil due to faulty oil seals. These type of rejections occurred frequently during ship construction and repair.

37. Based on my experience, knowledge and research, my opinions are that:

a. The fundamental first step to the Navy's ability to successfully fight wars is the design and construction of its combat and combat support vessels as an integrated weapons system. The design of the propulsion plants aboard these vessels, including turbine design and manufacture and material selection such as insulation, represent vital military combat-related decisions commensurate with state-of-the-art knowledge and industrial capability at the time. Each military specification developed by the Navy related to turbines and asbestos insulation aboard ship were necessary to meet the tactical and strategic military characteristics ultimately required by the CNO, the highest Navy officer. These specifications reflected the state-of-the-art and the special needs of vessels destined to either engage in or support combat activities.

b. Because of the Navy's superior knowledge of the tactical demands and operational requirements of combat vessels and of the availability of processes and materials in support of those needs, the Navy exclusively controlled the detailed specifications for its equipment in its propulsion plants and the type of insulation materials to be used with that equipment. It also exclusively controlled warnings related to health and safety implications of its selected insulation materials. The Navy could not, and did not, permit any equipment manufacturer or material supplier to interfere with mission success by supplying turbines or insulation that did not expressly comply with Navy specifications or by placing warnings on equipment (or in instructions or manuals accompanying the equipment) without Navy approval.

c. The Navy made calculated decisions on the allocation of its resources in light of its knowledge of the hazards of asbestos insulation and the technical and operational demands of war. The Navy instituted a comprehensive program, both aboard ship and in shipyards, to address the hazards of asbestos in a manner consistent with the unique circumstances of combat and combat-support ships that require the sensitive military balancing of tactical, strategic, and technical needs and budgetary constraints against the placing of sailors and civilian workers in harm's way in the defense of the Country.

I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct, and that if called as a witness, I could competently testify to the foregoing facts, all of which are within my own personal knowledge.

Executed this 19th day of August, 2013.

s/ Roger B. Horne, Jr.

ROGER B. HORNE, JR.

State of Washington

County of ________

Subscribed and sworn to before me this 19th day of August, 2013.

s/ April R. Ihde

Notary Public

My commission expires: 5/10/2017

United States District Court
Eastern District of Pennsylvania (Allentown)
CIVIL DOCKET FOR CASE#: 5:13-cv-00474-ER

DEVRIES et al v.
GENERAL ELECTRIC COMPANY et al

REPORT OF SAMUEL A. FORMAN. M.D.

I. BACKGROUND

1. I am a medical doctor specializing in preventive medicine and occupational medicine. I received a B.A. degree from the University of Pennsylvania majoring in history and biology, graduating *magna cum laude* in 1973. I attended Cornell Medical School, graduating with an M.D. degree in 1977. I also received a degree in public health in 1977 as a result of a joint program with the Harvard School of Public Health. Thereafter, I became board certified in occupational medicine after attending a residency at the Harvard School of Public Health.

2. From 1973 to 1977, I participated in Ensign 1975, a Navy program that permitted me to engage in active duty service and obtain hands-on training during the summers between medical school sessions. My participation in this program gave me background and experience different from that of many other prospective medical officers at that time, because very few medical officers engage in operational and administrative rotations as part of their service and training. In the summer of 1974, I engaged in a midshipmen cruise aboard the *USS Shreveport* (LPD-12) for the purpose of obtaining a general understanding of ship operations outside the medical department. I attended training classes and observed activities in all

parts of the ship including the engineering department, command information center, commissary department, supply and repair divisions, and aviation division. In the summer of 1975, I did a rotation at the Navy Bureau of Medicine and Surgery ("BUMED"), known at times as the Naval Medical Command. While there, I participated in medical administration in the office overseeing all medical training for the Navy and worked directly with a number of high-ranking officers in BUMED, including William M. McDermott, who at that time held the rank of Captain but who later became Deputy Commander of the Naval Medical Command. During this rotation, I had an extended assignment to analyze Navy expenditures for medical education at civilian universities to ensure the Navy's needs were being met. In the summer of 1976, I did a clinical rotation on the general and internal medicine wards at San Diego Naval Hospital, the largest military hospital in the world. By the time I graduated medical school, I had already accumulated approximately six months of active duty service from my summer internships. These internships gave me a fundamental understanding of the needs of sailors at sea, a general understanding of ship operations, including ship propulsion systems, and insight into the leadership and administrative side of the Navy.

3. In 1977, I graduated from medical school and went on full-time active duty in the Navy. I performed my internship at the Bethesda Naval Medical Center in Bethesda, Maryland during 1977 and 1978. I remained on active duty in the Navy until 1983. Thereafter, I continued to work for the Navy as a civilian

employee until 1986. My qualifications and credentials are more fully described in my curriculum vitae (Exhibit A).

4. Over the course of my active duty service in the Navy, I served aboard Navy ships whose primary purpose was to fulfill national defense missions of the United States. Assignments aboard ship, involving duty at sea, included, in addition to the *Shreveport* in the North Atlantic, *USS Duluth* (LPD-6) in the Eastern Pacific, and *USS St. Louis* (LKA-116) in the Western Pacific. At all times, these ships were performing missions and activities aimed at preparing for or deterring combat. In the military setting, a major goal of training is combat readiness. This training is intended to simulate combat and combat conditions. For example, the Navy hands out "battle efficiency" ribbons to ships that perform well in war exercises. Even combat support ships are required to remain ready to assist ships and sailors on the front line and, at times, these support ships must themselves go into harm's way. To achieve its mission, the Navy had to be willing to put life and limb at risk not just on the front line but also in support operations.

5. One of the highest profile operations in which I was involved occurred aboard the *St. Louis*, which was an amphibious attack transport ship deployed at the time to the Western Pacific for the purpose of carrying Marines, cargo (including heavily armored Marine Corps vehicles used in amphibious assault), equipment and supplies to Navy shore-based facilities. In March 1979, President Carter ordered the Navy to rescue a wave of Vietnamese and Southeast Asian refugees who were escaping communist Vietnam and local pirates into the South China Sea. The *St. Louis*

was the first ship of the Seventh Fleet to arrive on the scene. Fortunately the *St. Louis* was able to perform this mission without exchanging hostile fire; however, in order to perform this humanitarian rescue operation, the *St. Louis* had to travel just outside the twelve mile international limit and sail directly into an area threatened by actively hostile Communist interests. This situation represented an intense Cold War scenario, one of but many types of hazardous scenarios and missions for which the Navy must be prepared.

6. In the course of my active duty service, I also worked in Navy shore facilities, including shipyards such as the Long Beach Naval Shipyard. These facilities contributed to the defense of the country by engaging in industrial efforts to construct, repair and overhaul the Navy's combat and combat support vessels. My role was to ensure that the Navy personnel and civilians involved in these efforts performed their duties as safely as possible.

7. From 1980 to l 982, I ran an occupational health clinic at the Naval Weapons Station at Seal Beach, California, and assisted in the medical programs at the Long Beach Naval Shipyard. Among other responsibilities, I assisted in the asbestos medical surveillance program for over 2,000 federal Civil Service employees and uniformed sailors. At any one time, I was following 200 cases of asbestos disease.

8. In 1982, I was assigned to the Naval Environmental Health Center at Norfolk, Virginia. While stationed there, I designed occupational medicine programs with regard to Navy-specific occupational diseases, performed health hazard evaluations, inspected the occupational health programs of government facilities as part of the Navy Occupational

Safety and Health, or "NAVOSH," program, carried out epidemiologic studies, and trained Navy doctors and nurses in occupational medicine.

9. In 1983, a JAG officer for the Naval Medical Command requested that I become part of a team to locate, digest and organize government documents for production in asbestos litigation. Over the next year and a half, I investigated the Navy's historical handling and knowledge of various industrial hygiene issues, including asbestos disease.

10. In 1985, pursuant to Navy orders, I completed my review of Navy knowledge and practice in industrial hygiene, including its awareness of and response to health hazards of asbestos, as a formal assignment. My search for documents took me to the National Archives, other warehouses and storage facilities for records of the Navy's Bureau of Medicine and Surgery. I was given full security clearances for and unimpeded access to these facilities. I also conducted research at private facilities such as Harvard University's Countway Library of Medicine's section for rare books and manuscripts.

11. From my review of countless Navy documents and my studies while employed by the Navy, I acquired extensive knowledge as to the state of Navy knowledge and awareness regarding the hazards of asbestos.

12. Following my research, and with the approval of the U.S. Navy's Bureau of Medicine and Surgery, I published an article entitled "U.S. Navy Shipyard Occupational Medicine Through World War II" in the *Journal of Occupational Medicine*, Vol. 30, No. 1 (Jan. 1988) (Ref. 1).

13. Though I no longer hold any formal position with the Navy, since I left I have been asked on a number of occasions to speak to Navy medical and safety personnel on issues relating to the history of occupational medicine and industrial hygiene in the Navy.

14. I also am currently a Visiting Scientist in the Department of Environmental Health at the Harvard University School of Public Health.

II. DISCUSSION AND OPINIONS

A. Navy Occupational Health and Industrial Hygiene Organization

15. The Navy has always taken responsibility for the health and safety of its uniformed and civilian personnel. It has consistently exercised its discretion regarding hazard recognition and appropriate controls in Navy workplaces. As Navy Captain Ernest W. Brown, M.D., recognized as the architect of the Navy's formal occupational health program prior to World War II, wrote in 1940: "One of the most important concerns of the Medical Department of the United States Navy today is industrial hygiene, especially in navy yard practice." (Ref. 2).

16. This commitment was reflected in numerous other Navy statements and documents. In 1943, Secretary of the Navy, Frank Knox, in a statement cosigned by the Chairman of the U.S. Maritime Commission, E. S. Lamb accompanying "Minimum Requirements for Safety and Industrial Health in Contract Shipyards," stressed the Navy's commitment in this regard:

> The necessity for conserving manpower and promoting the physical welfare, health, and safety of what shortly will amount to one million workers in

> shipyards required that careful observance of standards for the prevention of accidents and protection of health be accorded. Aside from the weight which must be given humanitarian consideration, it is simply good common sense that as much care and attention be given to protecting the human factors in the war production program as is given machines.

(Ref. 3). Similarly, in a 1955 Naval Institute publication called *The Human Machine*, Captain Charles W. Shilling of the Navy Medical Corps described the "paramount importance" of Navy health: "[T]he medical component of the Navy has a heavy responsibility" with a mission to promote physical fitness, prevent and control diseases and injuries and treat and care for the sick and injured. (Ref. 4).

17. While the formal titles have varied over the years, the most senior Medical Corps officer in the Navy is the Navy Surgeon General, who is also the Chief of BUMED and who reports to the Chief of Naval Operations ("CNO"). The Navy Surgeon General has responsibility to spell out health programs, including prevention and injury care, for sailors and civilian workers (as appropriate). Medical Corps, allied health professions and enlisted hospital corpsmen are responsible for advising operational line commands to carry out preventive practices and to provide specialized industrial hygiene services. It is the responsibility of the Navy line authorities (the operational chain of command) to carry out these recommendations.

18. Given the breadth and sophistication of its military and industrial activities, the Navy recognized the need to establish departments and bureaus with specific expertise in scientific and technical areas of

importance. The Navy Medical Department (which encompasses BUMED, among other organizations)

> is actively concerned with all phases of life in the Navy and advises all components of the Navy on matters which may affect the health and well-being of naval personnel. . . . There is a Medical School, a Dental School, and a Medical Research Institute at the National Naval Medical Center, Bethesda, Maryland. There are also numerous other research units established in connection with operational activities throughout the world. . . . [T]he Medical Department and all of its component parts are working with the operational forces of the Navy, in all areas of naval importance.

(Ref. 4 at 275 and 276).

19. In addition to monitoring all health programs including industrial hygiene in both a quantitative and qualitative way, the Navy's Medical Department also originated extensive research activities:

> As it is with other component parts of the Navy, research is an intimate part of the Medical Department activity, the importance of which cannot be overemphasized. Through research we assist in the development of new equipment, new and better methods of care and treatment of various diseases and injuries; help in the problem of adjustment of naval personnel to all of the new and strange environmental situations in which they are placed; and, in general, provide the knowledge necessary for more efficient operation of the Navy.
>
> Research under the cognizance of the Bureau of Medicine and Surgery is accomplished in a large

> medical research institute, in several research laboratories, fleet and shore-based units, and in various naval hospitals. The scope of this research is extremely broad and parallels the total activity of the Navy.

(Ref. 4 at 277).

20. A 1956 Navy training document entitled "Naval Orientation" described the scope of BUMED's responsibilities:

> The Bureau of Medicine and Surgery is responsible for safeguarding the health of personnel of the Navy; the procurement of all medical and dental materials; research in medicine and dentistry; evaluation of the performance characteristics, from the physiological standpoint, of equipment designed for the use in naval service; the determination of standards of sanitation and hygiene; the professional education and training of medical personnel; and the establishment of professional medical and dental standards for clinical methods and procedures.

(Ref. 5 at 177).

21. Among the tasks of BUMED in connection with its research and monitoring activities was the distillation of the results of that experience into practical guidance for the rest of the Navy. The translation of the results of that experience into practices and procedures for Navy personnel, and the communication of those practices and procedures, necessarily involved the exercise of judgment by BUMED in determining what topics, and what specific information on those topics, should be disseminated to Navy personnel. Personnel recipients included officers, enlisted, civil servants and contractors. The communication of

such information was designed to ensure that recipients received precisely, and only, what was deemed appropriate in light of their duties and responsibilities, and the overall mission and operations of the Navy.

22. As a consequence of the Navy's approach to such matters, the knowledge of any individual Navy sailor – even an officer with command responsibilities – with respect to an issue like the hazards of asbestos cannot be taken as representative of the broader knowledge of the Navy on the topic. By design, that individual would have possessed only that knowledge necessary, in the view of BUMED, to the performance of his or her duties. Put differently, regarding asbestos – as with many other health and safety issues – there was extensive information regarding potential hazards and potential protective measures that were consciously not shared with the vast majority of Navy personnel who were deemed not to have a need to know.

23. As a General Medical Officer, I was not permitted to deviate from the standardized programs developed by the Navy Surgeon General for the health of Navy personnel, without approval from a more senior Navy officer except in extraordinary circumstances, such as if a ship was isolated or out of contact with more senior, knowledgeable and experienced officers.

24. All Navy personnel including medical officers must follow their chain of command to maintain good order and discipline. Enlisted personnel are indoctrinated during boot camp and training with the understanding that they must conduct all activities "the Navy way," meaning that Navy orders and instructions supersede any information or directions received from any source outside the Navy. Sailors must follow

orders trusting that their chain of command will have the mission of the Navy in mind and will address safety as best as possible. Unlike in the civilian community, all military personnel who refuse to perform an order could be subject to various penalties pursuant to the Uniform Code of Military Justice ("UCMJ"). Absent extraordinary circumstances, the Navy demands and enforces rigid adherence to the chain of command. It does so because it is the military's method for institutionalizing strategic considerations, highly specialized expertise, and prior experience and then transforming this information in an effective and predictable way into programs and orders for all personnel to follow.

25. Collective and uniform communication and implementation of Navy programs and orders are key to the Navy's operational flexibility. The Navy has numerous sailors with specialized capabilities. The Navy also maintains many ships and multiple shipyards with specialized capabilities. The Navy strives to ensure that each sailor is consistently trained, and that each ship in its fleet is predictably constructed so that it can rely on both the sailors and the ships to perform critical operations without endangering sailors any more than is necessary to achieve mission success.

B. Navy Knowledge of Asbestos-Related Health Issues

26. Consistent with the Navy's interpretation of the importance of industrial hygiene and occupational health, the Navy's programs in these areas have paralleled, and at times led, the development of occupational medicine and industrial hygiene in general, and asbestos-related issues in particular. The Navy's

knowledge in the areas of asbestos and associated health conditions has been quite complete when compared to available knowledge over time, and at least by the early 1940s, the Navy had become a leader in the field of occupational medicine relating to, among other things, asbestos dust inhalation exposure.

27. As early as 1922, the Navy recognized, as exemplified by its instructions to officers published in the *Navy Medical Bulletin*, the health hazards associated with airborne asbestos dust and the appropriate protective measures to prevent asbestos exposure. These included the use of water to dampen dust, exhaust systems to remove dust, enclosed chambers to prevent escape of dust and respirators. (Ref. 6). The Navy's knowledge of potential asbestos-related health problems, and of the means to control against them, continued to expand throughout the following decades, as senior Navy officers actively assessed, evaluated, controlled, and made recommendations concerning Navy policy regarding disease and injury prevention, including asbestos related occupational health hazards.

28. The Navy's health and safety apparatus on the eve of World War II was described in the 1939 Handbook of the Navy Hospital Corps published by the Bureau of Medicine and Surgery under the direction of the Secretary of the Navy:

> The United State Navy is one of the largest of the industries maintained by this Government. An organization has been set up in the Navy to protect its personnel, both civilian and naval. A safety engineer is provided, who acts directly under the Assistant Secretary of the Navy. He has supervision of the safety precautions taken to protect the civilian

> employees in the navy yards, ammunition depots, torpedo stations and the like. He is also a consultant in all matters pertaining to safety aboard ships, at training stations and other Navy Department activities. A naval medical officer is assigned to his office for the purpose of consultation in all matters pertaining to health and safety and to cooperate in devising means by which health may be protected and accidents prevented. Aside from this particular medical officer, all medical officers, dental officers, members of the Hospital Corps and nurses form the balance of the medical staff of this organization. It is essential that each one of these members know and understand the hazards to be encountered in the Navy, the steps to be taken to protect against injury and disease, the treatment of diseases and injuries arising therefrom and the organization of the medical personnel for such purposes. Naval medical personnel are required to perform duties ashore, at sea, in foreign countries, in the air and under the sea. In each of these places a variety of health hazards exist. It is therefore necessary that this [sic] personnel have a thorough knowledge of the industry to which they are attached, the hazards presented, the methods of prevention and the treatment of all injuries occurring.

(Ref. 7).

29. The Handbook of the Navy Hospital Corps also explained that all Navy yards have a commandant who "is responsible to the Navy Department for the protection of employees, as well as Navy personnel, under his command. He is familiar with . . . the health and accident hazards presented." Thus, the Commandant was "responsible for the appointment of the

safety engineers [who will] make inspections and recommend proper protective measures." The Handbook further called for the Navy medical officer to "advise the safety engineer and instruct the employees in safety measures and encourage them to cooperate in protective measures." These safety measures included required "masks for asbestos workers."

30. Also in 1939, the Annual Report of the Surgeon General of the Navy addressed the "Hazard of Asbestos," and described asbestosis as "an industrial disease of the lungs incident to inhalation of asbestos dust for prolonged periods." The Report noted the risk from "continued exposure to present occupational conditions" at Navy facilities, and directed appropriate methods for preventing such exposures, recommending the use of local exhaust ventilation to control asbestos dust exposure for insulators in the fabrication shop. (Ref. 8).

31. At about the same time, Navy Captain E.W. Brown undertook an assessment of asbestos exposure, and its prevention, in Navy yards. In an article entitled "Industrial Hygiene and the Navy in National Defense" published in 1941, Captain Brown prescribed appropriate measures for the prevention of asbestos exposure. These included use of respirators, local exhaust ventilation, and wetting of asbestos containing materials. (Ref. 2).

32. The Navy has historically directed all aspects of policy and procedure addressing the health and safety of Navy personnel. This direction has encompassed policies, practices and procedures to protect workers from dangers posed by exposure to asbestos. Indeed, the Navy has on several occasions over time

rejected offers of assistance from other leaders in the field.

33. For example, in 1941, the U.S. Labor Department's Bureau of Labor Standards offered to conduct inspections of health and safety conditions in Navy shipyards. Navy leaders rejected this offer. In a memorandum to Navy Surgeon General McIntire, Commander Charles S. Stephenson, head of the Division of Preventive Medicine within the Navy's Bureau of Medicine and Surgery, offered "[n]otes for consideration when you call on Assistant Secretary [of the Navy Ralph A.] Bard." Commander Stephenson advised Admiral McIntire that Assistant Secretary Bard

> asks specifically what the policy is concerning invitation of . . . the Bureau of Labor Standards, Labor Department into the Navy Yards to make a survey of the welding and other hazards. I told him that we had never done that sort of work and recommended against it, as I know who [the Bureau of Labor Standards] intends to send if it should be done.

Navy leaders recognized that other government departments had a high level of expertise, while rejecting the offers of assistance:

> I gave Mr. Bard and the two officers present a complete story of the beginning of this controversy from the Federal Administrator's letter: that is, that the United States Public Health Service had four teams of traveling scientists alleged to be able to make surveys of all of the Navy Yards and make recommendations for the correction of such hazards as were discovered.

He then emphasized:

> I told Mr. Bard that this was not considered the best policy, due to the fact that we had medical officers in the Yards and that in practically all instances recommendations of sound character had been made by medical officers. We saw no need of inviting the United States Public Health Service on its own invitation to do this job.

(Ref. 9).

34. The Navy's reluctance to accept these offers of assistance was based on concerns regarding possible upset of labor relations, and also for security at Navy facilities. Stephenson's memorandum makes clear that these concerns originated at the highest levels of Government:

> Likewise, I told him that I had spoken to you and that you had indicated that President Roosevelt thought that this might not be the best policy, due to the fact that they might cause disturbance in the labor element.

(President Roosevelt was familiar with the structure and operation of the Navy's shipyards and other facilities – and in particular with the functioning of the Navy during wartime – from his tenure as Assistant Secretary of the Navy from 1913 until 1920. Admiral McIntire was President Roosevelt's personal physician in addition to being the Surgeon General of the Navy.)

35. Stephenson's positions were taken even in light of knowledge that not all industrial hazards were adequately controlled at Navy facilities: "I doubt if any of our foundries would be tolerated if the State industrial health people were to make surveys of them." Asbestos, too, was discussed as an issue: "I am

certain that we are not protecting the men as we should."

36. Health and safety issues, including those relating to asbestos exposure, continued to be a major focus of the Navy and the United States Maritime Commission throughout World War II. In 1943, the Navy, along with the Maritime Commission declared its responsibility for the safety and health of their workers and took charge of implementing and staffing safety and health programs for those workers. Following extensive discussion with various constituencies, the Navy and the Maritime Commission jointly issued "Minimum Requirements for Safety and Industrial Health in Contract Shipyards" ("Minimum Requirements"). (Ref. 3). The specific requirements imposed by the document enunciated for private and contract shipyards expectations that were already in effect and implemented at the Navy's own facilities.

37. The Minimum Requirements identified asbestos-related disease as a potential hazard of shipyard work, explaining that exposure could result from handling, sawing, cutting, molding and welding rod salvage around asbestos or asbestos mixtures. The document advised that such jobs "can be done safely with:

1. Segregation of dusty work and,
2. (a) Special ventilation: Hoods enclosing the working process and having linear air velocities at all openings of 100 feet per minute, or

   (b) Wearing of special respirators.
3. Periodic medical examination."

The Minimum Requirements also warned that jobs involving exposure to asbestos require "respiratory protective equipment," in particular a "dust respirator." A ventilation supervisor (the safety engineer) was required to be trained to handle the entire ventilation program in the yard, which was to include classes, demonstrations and short talks on proper procedures.

38. The Minimum Requirements further called for employee safety training: "the time for the safety training of an employee to start is at the inception of his employment." "Employees shall have in their possession, and be instructed in the proper use of, all necessary personal protective equipment before being started on any job." Safety bulletin boards were to be located at each hull and shop, with "[s]afety posters and other material on the bulletin boards" changed at least semi-monthly. The type of safety posters used in these worker educational campaigns included materials reinforcing the use of masks for protection against disease-causing dusts. One such poster stated, "His mask keeps him on the job." (Ref. 10).

39. This commitment by the Navy to address the asbestos-related health concerns of Navy workers, as set forth in the 1939 Handbook of the Hospital Corps and the Minimum Requirements document, is further evidenced by dozens of other documents generated by the Navy and consultants it retained during the war years.

40. Later in the war, following extensive study of asbestos-related health issues, Dr. Philip Drinker, a Harvard professor and Chief Health Consultant to the Division of Shipyard Labor Relations and consultant to the Navy Surgeon General since 1941, wrote on January 31, 1945 to Captain Thomas J. Carter at the

Navy's Bureau of Medicine and Surgery. In his letter, he reported on analyses of airborne dust collected at Bath Iron Works, a leading contractor for construction of Navy vessels. Dr. Drinker summarized the results of the analysis: "This evidence is enough to indicate a fairly serious dust risk at Bath and to make it very probable that the same sort of thing will be found in other plants and yards where the same type of [asbestos] pipe covering materials are used." (Ref. 11).

41. In addition to asbestos health concerns revealed at Bath Iron Works, experience in some of the contract shipyards also came to the attention of Dr. Drinker and Navy authorities:

> I suggested to Admiral Mills that it would be very desirable for Navy to examine men handling the preparation of [asbestos] pipe coverings and their installation in at least two Navy Yards and two Navy contract yards as this is much more a Navy than a Maritime problem because the materials are used especially on Navy vessels with high pressure steam power plants. Admiral Mills agreed that such studies would be wise before Navy or Maritime accepted this asbestos risk as being significant in our general ship construction program.

(Ref. 11).

42. Dr. Drinker and his Navy colleagues published the results of the study he had suggested in W.E. Fleischer, et al., "A Health Survey of Pipe Covering Operations in Constructing Naval Vessels," 28 *Journal of Industrial Hygiene & Toxicology* 9–16 (Jan. 1946). (Ref. 12). The study reaffirmed the Navy's position regarding acceptable occupational dust exposure levels and dust control strategies. They offered

the conclusion that "[asbestos] pipe covering is not a dangerous trade."

43. The conclusions of this study were carried into practice in Navy workplaces following World War II. The January 1947 issue of the Navy's *Safety Review* publication noted that "[e]xposure to asbestos dust is a health hazard which cannot be overlooked in maintaining an effective industrial hygiene program." (Ref. 13).

44. Also during the second half of the 1940s, the American Conference of Governmental Industrial Hygienists ("ACGIH") evaluated the issue of asbestos exposures. This entity, comprised entirely of industrial hygienists with links to the government and academia, published threshold limit values for acceptable exposures to asbestos dust in the workplace. These standards were periodically updated over the years. Representatives of the Navy, trained as industrial hygienists, participated in the ACGIH. In recognition of the potential hazards associated with exposure to asbestos dust, a 1955 Navy Bureau of Medicine instruction adopted the ACGIH's threshold limit value for exposure to asbestos dust among Navy personnel. (Ref. 14). The 1955 threshold limit value as promulgated in the Navy instruction was the same level to which the Navy had sought to control exposures during World War II.

45. During the 1950s, the Navy continued to prescribe safe work practices to address potential shipyard hazards associated with exposure to asbestos dust. For example, a 1950 General Safety Rules Manual issued by the Puget Sound Naval Shipyard in-

structed workers to "[w]ear dust type or air-fed respirators for . . . handling amosite [asbestos] insulating materials. . . ." (Ref. 15).

46. In 1957, the Navy convened at the Boston Naval Shipyard a "Pipe and Copper Shop Master Mechanics' Conference" to address issues of concerns to those in the pipefitters' trade. At the conference were personnel from all twelve Navy shipyards and the Navy's Bureau of Ships in Washington, D.C.

47. The prepared remarks of a Long Beach Naval Shipyard official, included in the Minutes of the Conference reflect the Navy's stated policy that pipe insulators and laggers who handle asbestos products should wear respirators:

> Asbestos, when handled dry, produces vast amounts of silica dust. . . . [T]he material can be dampened to reduce the amount of dust liberated. However, the specified type of amosite [asbestos] for use on cold water piping is water repellent. Also material which must be removed from an existing installation is dry and powdery, being an excellent dust producer. . . .
>
> [D]uring 1956 eleven deaths from asbestosis were reported on the Pacific Coast alone. . . .
>
> I know that two of my insulators are now afflicted with this condition. How many more will become afflicted is something which I hesitate to predict.
>
> Again the solution is obvious. Remove the cause by substituting other products. . . .
>
> In the meantime, the answer is the wearing of respirators by all who handle asbestos products.

(Ref. 16).

48. A New York Naval Shipyard official added that if those working with asbestos insulation have not been "told . . . to put on masks, you are more or less the cause of their trouble." That same official added:

> I think everyone, who has people doing this type work, should warn their people regarding the handling of this material. With the proper handling of it on the job, and it has always posed a very big problem, because the men don't want to wear the masks, or get this dread disease. It is difficult to protect them. After a couple of years of mandatory wearing masks, I think they should realize the danger. I think everyone ought to enforce the wearing of masks. Don't forget this is something that injures people's health. We should do something about it- and fast, and I am convinced that what we are doing is not enough. We should not have people handle this material withou[t] protection.

49. On January 7, 1958, the Department of the Navy issued a "Safety Handbook for Pipefitters," which explicitly addressed the asbestos hazard and again set forth Navy policy for controlling this hazard. (Ref. 17). This handbook – one of many safety handbooks issued by the Navy – stressed that "[a]sbestos dust is injurious if inhaled," and warned those working with asbestos insulation materials to "[w]ear an approved dust respirator for protection against this hazard."

50. During this time period, study of asbestos-related health issues was ongoing at various Navy facilities. For example, Occupational Health Hazards Releases from the Navy's Bureau of Medicine and Surgery on February 1, 1961 (Ref. 18) and May 1, 1961

(Ref. 19) reported on studies of personnel engaged in the handling of asbestos-containing materials and on recommendations, including the use of respirators, exhaust systems and worker training at Puget Sound Naval Shipyard. A 1961 Marine Pipe Covering and Insulating Manual at Puget Sound set forth "General Safety and Health Practices" that included instructions to "[h]andle amosite . . . materials carefully to avoid [its] dust[]," "sprinkle amosite with water whenever possible to keep dust down," and "[s]ee that your chest is X-rayed at least once a year to detect the possibility of . . . asbestosis." (Ref. 20).

51. Concurrently, similar activities were ongoing at Long Beach Naval Shipyard, which had "continuous health education program for . . . asbestos workers" at Long Beach Naval Shipyard, including a showing of a film entitled "The Air We Breath," followed by "a short discussion of the hazards of breathing asbestos fibers and the use of dust respirators." (Ref. 21). Beginning in 1958, health personnel at the yard had begun "a study . . . of pipecoverers (asbestos) working conditions" at Long Beach Naval Shipyard. The study had commenced in 1958, and it included "[c]hest x-rays and vital capacity test[s] . . . on [792] asbestos workers. The report also noted that at the time the study began, a "former [Long Beach] employee was receiving compensation for asbestosis." (Ref. 22).

52. Similar investigation and study was ongoing at other Navy facilities. In September 1962, a Navy Department Occupational Health Hazards Release reported that at Boston Naval Shipyard "[a] study was conducted to obtain current data for evaluating the exposure of pipecoverers to asbestos containing dust." The study involved the collection of samples taken in

the pipecoverers' shop and also aboard ship. The results showed that "[d]ust concentrations found in the general atmosphere of the shop were within permissible exposure limits at the time of sampling," but that "[t]he excessive dust counts obtained aboard ship, emphasized the need for the wearing of approved dust respirators by pipecoverers." (Ref. 23). A few years later, another Release described the results of "[r]andom dust counts . . . aboard ship during the removal of amosite insulation from two fire room boilers" by two pipecoverers. Navy personnel observed that "[o]ther tradesmen working the same work area as pipecoverers are also quite often exposed to the asbestos containing dust and usually remain in the area sometime after the pipecoverers," and "emphasized that respiratory protection should be provided whenever long exposures to high dust concentrations" occur. (Ref. 24).

53. The ongoing development of the Navy's policies and practices to protect workers from asbestos-related health concerns during the early 1960s was reflected, for example, in an article entitled "Asbestosis" published in the October 1962 issue of the Navy's Internal *Safety Review* publication by Captain H.M. Robbins, a Navy physician, and W.T. Marr, a Navy industrial hygienist from the Long Beach Naval Shipyard. The article addressed the potential for exposure to asbestos aboard ships:

> Aboard ship, a great variety of insulation is performed. Insulation blocks are shaped with a saw, pads are supplied to fittings, insulation cement is applied to blocks and covered with asbestos cloth. These and other operations take place in nearly all compartments; however, most work is done in the

> machinery spaces. By far the greatest potential exposure to asbestos fibers occurs during ripout of old insulation for ship overhaul or reconversions.

The article concluded that "[t]he worker's best protection is to avoid careless creation of dusty conditions, use damp material when possible, and wear respiratory protection constantly." (Ref. 25).

54. In 1968, the Navy came under scrutiny for its handling of asbestos-related health issues. On July 30, 1968, Murray C. Brown, Medical Director of the Public Health Service, wrote to Vice-Admiral R.B. Brown, the Chief of the Navy's Bureau of Medicine and Surgery, stating that "[o]ne of our grantees, Dr. Irving Selikoff of New York University, has recently completed a study of non-insulation shipyard workers' exposure to asbestos," and that "Dr. Selikoff reports he has some interesting data and has requested that we arrange an information meeting with your Department and the U.S. Department of Labor to discuss his findings." (Ref. 26). On December 5 of that same year, Admiral Brown reported to others in the Navy health establishment that "Doctor I.J. Selikoff of Mount Sinai Hospital, through the news media, stated that he has warned the Navy and other Federal departments of his findings relating to the unusual incidence of asbestosis among shipyard asbestos workers. The newspaper articles stated that the Federal agencies including the Navy have not publicized the hazards." (Ref. 27).

55. In a "Hazard Analysis" commissioned in response to this external criticism of the Navy's safety practices, Commander Rosenwinkel of the Navy's Bureau of Medicine assured that:

> [T]he Navy's shipyards have for many years been aware of the hazards of asbestos and have initiated appropriate safety precautions. Insofar as possible, all fabrication work [with insulation] is performed in the shops where adequate safety precautions can be observed. These precautions include controlled ventilation, use of respirators, and wetting down of the material. During "rip out" operations, respirators are worn and ventilation is controlled as far as possible.

Similar language was prepared "for inclusion in a statement to be issued by Rear Admiral J.J. Stilwell, Shipyard Management Directorate":

> The United States Navy is well aware of the hazards of asbestos to its employees engaged in ship construction and ship repair at naval shipyards. Hazard control measures implemented by the shipyard medical departments and practices are in accordance with accepted standards of industrial hygiene practices in the United States. Stringent efforts are directed at keeping the concentration of air borne asbestos dust below the level recommended by the American Conference of Governmental Industrial Hygienists. An energetic periodic physical examination program insures the health of personnel exposed to this hazard.
>
> For more than two years, the Naval Ship Systems Command and the Commander of Boston Naval Shipyard have been cooperating with a prominent investigator in a study whose ultimate goal is to define safe working conditions with respect to air home asbestos. Upon the development of further objective, well founded recommendations for the control of this hazard, the Naval Ship Systems

> Command, in cooperation with the Bureau of Medicine and Surgery, will take the necessary steps to implement them at the naval shipyards and all naval activities.

(Ref. 28). The message was clear, and consistent: the Navy would handle asbestos issues in its own way and through its own channels.

56. The development of the Navy's policy towards asbestos-related health issues, and of its program for addressing asbestos exposure to Navy personnel, continued into the 1970s. On February 9, 1971, the Commander of the Navy's Ship Systems Command issued to numerous Navy bureaus and commands its Instruction 5100.26. That document began by recognizing that:

> [t]he most critical use of asbestos in the Navy from a safety viewpoint is in the fabrication, installation, repair or removal of pipe and boiler insulation materials. Some workers sustain accidental contacts either while employed in various capacities where asbestos products are processed or when working in plant areas in which an environmental pollution of the air exists due to asbestos.

In light of these concerns, the purpose of the document was "to prescribe appropriate safety precautions during the use of asbestos," and it decreed that:

> [t]he following safety precautions will be observed by all supervisors and workers engaged in the fabrication, installation and/or removal (ripout) of asbestos-containing insulation material. The provisions of this instruction will be effective as of this date. The provisions in this instruction are considered as minimum health and safety requirements.

More stringent restrictions may be applied by local commanders.

The document then listed nearly fifty specific work practices to be employed to protect workers from asbestos exposure in handling or working in the vicinity of asbestos-containing products. (Ref. 29).

57. In the years that followed, Navy authorities promulgated a series of expansions and refinements of its program for addressing asbestos exposure to Navy personnel. Among the numerous iterations were the following:

a. BUMED Instruction 6260.14 (June 7, 1973) (Ref. 30);

b. OPNAV Instruction 6260.1 (April 9, 1974) (Ref. 31);

c. NAVSEA Instruction 5100.2 (October 24, 1975) (Ref. 32); and

d. NAVSEA Instruction 5100.2A (September 11, 1979) (Ref. 33).

58. Despite the promulgation of such control procedures, there continued to be instances of airborne asbestos dust for certain operations, exceeding then-current standards, inconsistent use of respirators and other control measures even when recommended by Navy authorities, and incomplete understanding of the hazard by the workers involved. The Navy was aware that execution of its own programs in this regard was uneven despite its efforts.

59. Similarly, a January 23, 1974 Navy Department of Occupational Health Hazards Release reported that at Charleston Naval Shipyard "[a] survey was made aboard ship while Temporary Service Shop

electricians were preparing and installing asbestos cloth and rope under a boiler. . . ." Measured dust concentrations exceeded the permissible exposure limit. Navy personnel observed an "ill-fitting" respirator on one of the workers, and described work methods that were

> improper for control of asbestos dust. No signs were posted to warn that asbestos dust was being generated and that dust respirators were required. Asbestos waste . . . w[as] handled with poor technique and not conductive [sic] to minimizing asbestos dust generation. . . . An immediate conference was held with the cognizant General Foreman and all violations of asbestos control instructions, poor work techniques, fit of respirators, and asbestos disposal were discussed.

It was also noted that "[r]emoval of asbestos lagging aboard ship creates a high asbestos fiber concentration in the work environment." Navy personnel observed that "[c]ontrol of asbestos dust contamination throughout the rest of the ship is not guaranteed, and unfiltered exhaust ventilation to the outside of the ship is undesirable," and recommended purchase of a "portable exhaust blower, equipped with and EPA approved cleaning system." (Ref. 34).

60. The same Release also reported that at Long Beach Naval Shipyard

> [d]uring routine monitoring of pipecoverers and insulators performing ripout of asbestos insulation in posted engineering spaces, it has been observed that ship's personnel frequently ignore the warning signs and move through the restricted areas. Ship's

> personnel also have been observed removing asbestos insulation without using respiratory protection and using air hoses to blow down spaces contaminated with insulation dust. An increased effort is being made to indoctrinate the shipboard personnel regarding the dangers of exposure to asbestos dust.

(Ref. 34).

61. The Navy was committed to maintaining complete control over existing military specifications, policies and procedures with respect to asbestos-containing materials and worker practices with those materials. The Navy maintained a fierce autonomy over hazard recognition and control, because the Navy considered itself the ultimate authority on naval systems and military workplaces. Regardless of the source of other information, the Navy viewed its unique knowledge as a strategic advantage in addressing hazard identification and control in its workplaces.

70. In the effort to achieve its mission, the Navy made trade-offs between the use of asbestos and the potential health impact on personnel. In the Navy's judgment, the beneficial aspects of asbestos from an engineering standpoint (technical performance, cost, weight, etc.) made it the best thermal insulation available and a critical war material. As knowledge of asbestos health risks evolved, the Navy made sensitive military mission-related decisions about deriving the benefits of asbestos while controlling its risks. Moreover, when the hazards of asbestos became more fully known to the Navy and the scientific community in the late 1960s, the Navy determined not to do an immediate fleet-wide elimination of asbestos. At the time, Navy leaders were concerned that a large scale, immediate asbestos removal program would pose at

least three problems: excessive cost; mission impairment; and increased health hazards to removal crews from disturbing fixed, in-place asbestos.

71. The Navy asserted for itself the role as final arbiter of what was best with respect to industrial hygiene in its unique workplaces to carry out its national defense mission. The Navy's reasons for this approach include: harmonizing industrial hygiene with its overall operations; maintaining security of its facilities; and unifying communications to its workers.

72. The Navy rejected participation from manufacturers in its efforts to alert its personnel to potential asbestos hazards in Navy operations. The Navy pursued the issue in its own way. Professor Drinker recorded:

> I met with the manufacturers of the materials used at Bath and they stated they would be glad to get out a brief statement of precautions which should be taken in the light of their own experience and that they would inform their competitors that I had asked them to do so. I understand that neither Navy nor Maritime wants any change in the specifications as the performance with the present materials is entirely satisfactory. From a health standpoint we do not believe any specification changes are needed.

(Ref. 11.)

73. BUMED, through a litany of instructions, bulletins and other communications, developed work practices and procedures designed to take what BUMED deemed to be appropriate precautions against workplace and environmental hazards to Navy personnel.

74. Not surprisingly, in my research, I have not located a single instance in which the Navy, at any time during the 1930s through the 1960s, instructed or permitted a supplier of engineering equipment to a vessel or facility to affix or provide any asbestos- related warning with its equipment. The Navy has not depended on equipment warnings in its workplaces concerning long-term occupational health issues. Rather than depending on equipment signage or labeling, the Navy put its efforts into work practice training, specifications for materials being used in its unique workplaces, and the hierarchy of industrial hygiene controls.

75. The Navy's approach to the protection of its personnel from health hazards — and the lack of a role for equipment manufacturers in that process — is exemplified by the Uniform Labeling Program, SECNAV [Secretary of the Navy] Instruction 6260.3. (Ref. 44).

76. The Uniform Labeling Program had as its stated purpose "to standardize on [sic] labeling requirements for hazardous chemical products. . . ." It did not require any actions of parties outside of the Navy, including manufacturers of equipment. It is also clear that the Navy's Uniform Labeling Program was strictly an internal document. In other words, the program was designed by the Navy, for implementation by the Navy. It was not intended as a set of requirements governing the activities of outside parties. The Uniform Labeling Program is an internal Navy program whose addressees are Navy Commands: "Scope: The instruction applies to the labeling of all hazardous materials throughout the Naval Establishment wherever distribution of hazardous chemical

and materials is made to the actual consumer (shop, office, or unit)." (Ref. 44).

77. The internal nature of the Uniform Labeling Program is evident from its provisions:

(a) The Navy Department Standardization Office was directed to assign a Navy project to "standardize the printed labels in respect to quality of paper, size, color, shape, insignia, wording, and design; quality of the glue; specifications for inks including colors of inks); and other related matters." (Ref. 44 at 4.a.);

(b) The Navy's Bureau of Supplies and Accounts was directed to "initiate procedures to have the necessary labels stocked as General Store items for use by all naval activities." (Ref. 44 at 4.b.);

(c) Classification of hazardous chemicals was to "be accomplished through the joint efforts of the technical bureaus in that each Bureau shall be responsible for passing on those aspects, of any single item, which fall within its technical purview." (Ref. 44 at 4.c.).

(d) The document listed the responsibilities of a Navy Safety Precautions Board, and of Navy bureaus and offices, and of the Marine Corps, in implementing the program. (Ref. 44 at 4.d & 4.e.).

78. The Uniform Labeling Program expressly states that it does not impose any requirements on manufacturers of products. Consistent with its focus on chemical materials and substances, the document makes reference to container labeling that may be necessary for intrastate or interstate shipping, and to

labeling by "manufacturers of chemicals" in accordance with Manufacturing Chemists' Association guidelines. (Ref. 44 at 2.a.).

79. The Uniform Labeling Program was prompted by "[t]he rapid development of new chemical products and the introduction of new chemical processes," and by the Navy's view that "[w]arning labels affixed to containers of hazardous chemicals are one of the most practical means of accomplishing th[e] objective" of ensuring that Navy personnel take "precautionary measures . . . during the handling of toxic and dangerous chemicals." (Ref. 44 at 3).

80. Throughout the SECNAV Instruction describing the Uniform Labeling Program, the focus is on chemical products, and on the appropriate labeling for containers of chemical products. The document includes as an enclosure an alphabetical listing of materials it covers, all of which are toxic chemicals or materials. There is no mention of or suggestion that the program has any applicability to equipment such as pumps or valves, or to products such as gaskets or packing, or does the Uniform Labeling Program anywhere mention asbestos.

81. The documents referenced in the Uniform Labeling Program also refer to labeling of containers of hazardous chemicals. For instance, there is reference to the Manufacturing Chemists' Association's Manual Ll, "A Guide for the Preparation of Warning Labels for Hazardous Chemicals." (Ref. 45). Like the Uniform Labeling Program itself, Manual L1 expressly states that it is intended to provide information to "every person using, handling or storing *chemicals*." It expresses the view that "[t]he most practical means" of

disseminating such information is "by warnings affixed to containers of hazardous *chemicals*." (Ref. 45 at 5 (emphasis supplied)). There is nothing in the document to suggest that it relates to instructional or other documentation accompanying machinery or equipment, or that it relates to finished products such as gaskets or packing.

82. That the Uniform Labeling Program imposed neither internally within the Navy nor on manufacturers of machinery or equipment any responsibility for labeling of asbestos-containing materials is belied by the Navy's own implementation of the program is exemplified by a January 15, 1960 Occupational Hazards Release summarizing significant information on occupational health and industrial hygiene from through the Navy and distributed by the Chief of the Navy's Bureau of Medicine and Surgery. The document reported on the review by a Navy shipyard of new products "[i]n accordance with SECNAV Instruction 6260.3 and BUSHIPS Instruction 6260.3 on labelling toxic materials." With respect to "Hy-Temp Block Insulation," an insulating material containing 12–15% asbestos, the Navy concluded as follows: "No label." (Ref. 46). The fact that the Navy determined that no hazard label was appropriate for an asbestos-containing insulation material of the type whose hazards it had been aware of and discussing since the 1920s is inconsistent with the notion that the Navy sought, or would have accepted, asbestos-related warnings affixed to equipment or machinery or in technical documentation relating to such items.

83. The Navy's 1969 Consolidated Hazardous Item List, NAVSUP Publication 4500 issued more than a decade later, had the same focus and purpose

as the Uniform Labeling Program. (Ref. 47). The document expressly governed the labeling of "containers," and it stated that the purpose of labeling it requires is "to warn users of the potential dangers involving the use of the material in the container." (Ref. 47 at VJJI). There was no suggestion that the document applied to equipment or its manufacturers. Like the Uniform Labeling Program, the Consolidated Hazardous Item List is an internal Navy document, describing procedures intended to be implemented by the Navy.

84. Nor were military specifications among the means by which the Navy sought to protect its personnel against long-term health issues such as asbestos exposure. Rather, protection against such hazards was undertaken, through the Navy's Bureau of Medicine & Surgery, through a comprehensive system aimed at identifying evaluating potential threats to the long-term well-being of Navy personnel and developing appropriate training and procedures to mitigate those threats. While military specifications were outward looking – directed to vendors outside the Navy – development and implementation of protective measures regarding asbestos was viewed as an internal Navy issue.

85. The language in military specifications governing technical manuals for equipment is consistent with my overall experience that the Navy did not view manufacturer labeling or warning as an important, or in many instances an appropriate, means of protecting against exposure to ubiquitous, well-known, long-term potential health hazards such as asbestos. For example, MIL-M-15071D, dated June 6, 1961 and governing "Manual, Service (Instruction Books) for Shipboard Electrical and Mechanical Equipment" stated

that use of cautionary language "should be as sparing as is consistent with real need." (Ref. 48 at para. 3.3.6).

86. Consistent with my experience that the Navy saw little value, and much potential for confusion, in extensive use of caution labels addressing common hazards or conditions, particularly when no threat of immediate injury or harm to individuals or equipment was present, the Navy's directed that warnings in technical manuals be "sparing." Rather than depending on equipment signage or labeling, the Navy put its efforts into work practice training, specifications for materials being used in its unique workplaces, and the hierarchy of industrial hygiene controls.

87. The kinds of warnings the Navy did permit in equipment technical manuals underscore that the Navy's focus in this regard was on immediate hazards to life and equipment operation as being appropriate for inclusion in equipment manuals. Such warnings were related to materials that presented immediate hazards to life and equipment, including, for example, solvents which have long been recognized as material that present both inhalation and flammability hazards. Both of these hazards can, of course, result in immediate, severe injury or damage.

88. Similarly, carbon tetrachloride which, while a solvent, is not flammable, is hazardous based in part on its potential to break down and release toxic phosgene gas at elevated temperatures. The release of phosgene gas, which was used as a chemical weapon during World War I, presents a risk to users or others in the vicinity of poisoning.

89. The potential for immediate injury due to inhalation or explosion presented by solvents presents a

hazard fundamentally different from the type of disease risk that the Navy has long known to be associated with exposure to asbestos.

90. An acute injury or accident hazard of the type associated with solvents is a type of "safety" risk long viewed by the Navy as the responsibility of safety officer and the line command. By contrast, asbestos presents a long-term, environment threat to "health" of personnel. The Navy has traditionally handled such health risks under the technical purview of the medical department. The fundamental distinction between safety and industrial health is evident, for example, from the "Minimum Requirements for Safety and Industrial Health in Contract Shipyards" (Ref. 3), which present separately "Minimum Requirements for Industrial Health" and "Minimum Requirements for Safety."

91. As a consequence, the fact that the Navy permitted, or perhaps required, warnings regarding solvents in some equipment technical manuals does not mean that the Navy likewise wanted, or would have permitted, asbestos-related cautionary language in those documents during the period in question.

92. Despite numerous opportunities, Navy health authorities declined to adopt requirements for product labeling relative to asbestos-related health hazards within the Navy, much less as a requirement for suppliers of equipment for inclusion in technical manuals or other documentation.

93. For instance, the Navy's 1922 *Navy Medical Bulletin* lists "four effective methods [wet methods, exhaust systems, enclosures and respirators] that

may be used to prevent the inhalation of dust generated during industrial processes." While the document states that "[n]o one of these can apply to all conditions" and "the particular method to be used must be adapted to the peculiarities of the process," there is no mention among the potential protective measures of labels or warnings on packages or instructions for asbestos-containing materials. (Ref. 6).

94. Similarly, the "Minimum Requirements" adopted by the Navy and the Maritime Commission in 1943 contained no reference to or recommendation for labeling on packages or instructions among its recommended safety practices for handling asbestos-containing materials. Rather, the document stressed segregation of work areas, ventilation, respirators, and periodic medical examinations for workers handling asbestos-containing insulation materials. The only references any kind of signage was to "posters and other material" to be posted on bulletin boards on ships and in land-based facilities. (Ref. 2).

95. Decades later, the Department of the Navy's Instruction 5100.26, while comprehensive, made no recommendation and imposed no requirement that packaging or instructions for asbestos-containing products contain warnings regarding potential hazards. Among dozens of required work practices and procedures, the Instruction required the posting of "adequate warning signs" at the entrance to insulation fabrication shops and around areas where removal of asbestos-containing insulation was being conducted:

1. RESTRICTED ACCESS
ASBESTOS FABRICATION AREA

2. RESTRICTED ACCESS
ASBESTOS INSTALLATION/RIP OUT
WEARING OF RESPIRATORS REQUIRED

Thus, the Navy continued its practice of controlling asbestos exposure through restrictions on access, training and implementation of appropriate work practices and equipment. (Ref. 36).

96. Only in 1973, in BUMED's Instruction 6260.14, did the Navy direct its personnel that

> [c]aution labels shall be affixed to all raw materials, mixtures, scrap waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers occur in excess of the permissible exposure concentration.

The Navy specified the content of the required caution labels. I am not aware that at that time the Navy took any steps to require manufacturers of equipment to place asbestos-related warnings on their products or in literature that accompanied them. (Ref. 37).

C. <u>Gaskets and Packing</u>

97. With specific reference to potential hazards associated with the handling of asbestos-containing gaskets and packing, I am aware from my research and from my personal experience in the Navy that these materials were regarded as negligible sources of asbestos exposure. For example, a December 9, 1968 U.S. Department of the Navy Memorandum regarding "Hazards of Asbestos" stated that

> [a]ll of the asbestos in [gasket and packing materials] is fabricated as cloth, rope or compressed sheet with binders, so that the items are not friable when they are cut. Thus, these items do not cause dust in shipboard applications. In addition, in many instances, they are received already incorporated in the finished assembly such as a valve, and do not require fabrication by the shipyard. For these reasons, packings and gaskets containing asbestos are not considered to be a significant health hazard.

(Ref. 32).

98. This conclusion was reaffirmed in the published literature by P.G. Harries, who made extensive study of asbestos exposure in shipyards in the United Kingdom. In "Asbestos Dust Concentrations in Ship Repairing: A Practical Approach to Improving Asbestos Hygiene in Naval Dockyards," *Ann Occup Hyg 14*: 241–254 (1971), Harries concluded that asbestos-containing gaskets, which he referred to as "high temperature jointing and packing materials," presented "[n]o health hazard in forms used in shipyard applications." He also noted that "[n]o substitute heat-resistant material is available" for asbestos in these applications. (Ref. 49).

99. A 1973 publication of the International Agency for Research on Cancer – B*iological Effects of Asbestos* – stated that "[t]here is no conceivable health risk in the use of asbestos-based gasket materials." (Ref. 50 at p. 325). Well-known asbestos researcher and health advocate Dr. Irving Selikoff wrote, in his 1978 book *Asbestos and Disease* that "[h]igh temperature jointing and packing materials" containing "[a]sbestos fiber" and "(c]ompressed asbestos fiber"

present "[n]o health hazard in forms used in shipyard applications." (Ref. 51 at p. 267).

100. The lack of concern for asbestos exposure from asbestos-containing gaskets and packing expressed in Navy documents and the writings of researchers such as Hanies and Selikoff is entirely consistent with my experience as a uniformed and civilian Navy occupational medicine physician.

101. In addition to the documents referenced and discussed above, the development of the Navy's knowledge of asbestos-related health issues and of appropriate workplace practices and controls to prevent exposure to elevated levels of airborne asbestos also is reflected, among others, in the documents listed Exhibit B, which comprise part of the bases for my opinions on these topics.

III. CONCLUSIONS

102. Although my opinions are set forth throughout the entirety of this report, the paragraphs below provide a general summary of my opinions.

103. The Navy made its decisions with respect to the use of asbestos in accordance with Navy operating requirements and in furtherance of Navy missions, and in light of the Navy's knowledge of associated health hazards at the time and of its perception of the requirements of federal law. The Navy's extensive and evolving knowledge of the hazards of exposure to asbestos and the means to control those hazards were weighed by the Navy against the benefits provided by its use. These benefits included meeting national defense needs in a standardized, efficient and low-cost manner that would not delay or hinder ship availabil-

ity, especially during times of war. The Navy was informed in this decision-making by close contacts and liaison with relevant academic communities, professional organizations and other government agencies.

104. Similarly, the Navy's handling of and programs regarding workplace safety and hazard communication, as they related to asbestos and other issues, reflected the Navy's balance of various considerations, including combat readiness, maintenance of the necessary command structure, the needs of discipline and the hierarchy of risks presented by life and work aboard a combat vessel. In general, the Navy chose to address long-term workplace health issues in the course of training for various trades and jobs, rather than using labeling or other written materials to accompany products into the workplace.

105. The Navy's occupational health program in no way depended upon, required or sought advice from equipment manufacturers regarding long-term occupational health issues, including those posed by exposure to asbestos dust. I have not uncovered – nor based on my research and experience and the extent of the Navy's knowledge in these areas would I have expected to – situations in which the Navy solicited from suppliers of shipboard equipment any information or guidance regarding the appropriate methods for the prevention of exposure to asbestos. Given the Navy's state-of-the-art knowledge concerning asbestos related hazards and its robust safety and health program, it would be unreasonable to assume that the Navy would have accepted any advice pertaining to asbestos related safety precautions from a manufacturer of equipment.

106. My opinions set forth herein are held to a reasonable degree of scientific certainty.

DECLARATION OF LAWRENCE STILWELL BETTS, MD, PhD

I have been asked by legal counsel to expand my discussion of several areas which I have previously addressed in trial and deposition testimony, and in prior declarations, affidavits, and reports. To this end, I, Lawrence Stilwell Betts, MD, PhD, CIH, FACOEM, declare that:

1. I retired from the United States Navy as a Captain in 2001, and now have a very active professional practice in science and medicine based in Poquoson, Virginia. As reflected in my Curriculum Vitae (Betts, 2012), I am the President of my own medical and scientific practice. I routinely consult on, or work with, difficult and complex medical cases where treatment, or exposure or possible consequences of exposure, are in question. My professional associations include a wide variety of government, industry, and professional organizations, as well as academically – and privately – practicing professionals. I also teach, mentor, perform research, develop prevention and treatment protocols, and write medical articles and text chapters. I am a Clinical Professor at the Eastern Virginia Medical School where I have had a continuous academic relationship and have been teaching toxicology, previously with the approval of the US Navy while I was on active duty, since 1979. I serve on several national committees addressing broad, as well as specific, issues in occupational and environmental health. I am board certified in both occupational medicine by the American Board of Preventive Medicine, and in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene. Together with the late W. Clark Cooper,

MD, and Mitchel R. Zavon, MD, I am one of the original three "medical scientists" to have ever been elected to Fellowship in both the American College of Occupational and Environmental Medicine and the American Industrial Hygiene Association; a fourth, Sidney Siu, MD, was recently added to this short list of physicians who are also Certified Industrial Hygienists, in 2012. The anticipation, recognition, evaluation, and control of hazardous conditions are the fundamentals of industrial hygiene and my practice of preventive medicine and public health. The emphasis of my entire career has been the prevention of illness and the promotion of health through the application of the professional tools of my scientific and medical knowledge and experience. After my retirement from the US Navy, I was presented the VADM Richard A. Nelson Award for my career contributions to Navy and Marine Corps readiness through leadership in prevention of disease and promotion of health.

2. During my Navy career, I was assigned to billets with professional duties and increasing responsibilities, initially as a scientist in industrial hygiene and toxicology, and later as an occupational and environmental medicine physician and medical toxicologist. I became one of the first physicians to qualify and be designated a Surface Warfare Medical Department Officer (SWMDO). I have spent time at sea on a large number of United States Navy and United States Naval ships and I have worked in and directed occupational health programs at Naval shipyards, air rework facilities, weapons stations, and other major shore facilities in the San Francisco Bay area and the Tidewater area of Virginia. I served as a physician on the USS KITTY HAWK (CV-63) during her extensive

Service Life Extension Program (SLEP) in the Philadelphia Naval Shipyard from 1987 to 1989. Based upon my scientific and medical training, and experience as a Navy officer for three decades, and now as an active governmental consultant for over a decade, I am generally familiar with the industrial products that were used by the Navy and in maritime work environments, both ashore and afloat. I am also familiar with the history and practice of the Navy occupational health program from its early days before World War II until the present time. During the four decades of my professional life, I have also become familiar with, and evaluated occupational exposures to, asbestos–containing and other materials used in the electrical trades, aircraft and aerospace industries, nuclear power facilities, and several other trades and industrial/commercial activities which are not unique to the Navy or maritime industries.

3. Based upon my scientific and medical training, and experience as a US Navy officer for three decades, I am familiar with the Navy mission, the Navy command structure for Navy active duty and civil service personnel, the maritime work environments, both ashore and afloat, and the industrial products and equipment that were used in shipbuilding applications. I am also familiar with the history and practice of the Navy occupational health program from its early days before World War II until the present time.

4. I have been asked by counsel to address the following issues based upon my knowledge, experience, and research, and to report my findings and conclusions:

a. **What are the fundamental missions of the United States Navy (US Navy; Navy) and** the Navy Medical Department, and how is the Navy organized to fulfill those missions?

b. What role did asbestos (primarily as used in thermal insulation products) play in Navy and maritime shipbuilding and maintenance during the period from before WWII through the enactment and implementation of the Occupational Safety and Health Act (PL-91-596) in the 1970s and thereafter?

c. What did the Navy and other Federal Government Departments and Agencies, private shipyards and employers, as well as organized labor, know regarding the health hazards of asbestos during this time period? Additionally, how did this knowledge affect the use and handling of asbestos during the post-OSHA era?

d. Was there additional occupational health information about asbestos, available during the relevant periods of time, which should have been provided by an equipment manufacturer or vendor supplying a product to the Federal Government in accordance with specifications, or to a private industrial or maritime employer, that would have meaningfully enhanced existing knowledge, and that would have been likely to alter established specifications, policies, and procedures regarding the use of asbestos- containing products and materials?

- **e. In fulfilling its mission, did the Navy engage in "risk-balancing" between issues critical to mission success and the risks of asbestos exposure to the health of Navy Department personnel – both active duty and civilian?**
- **f. Whether, and to what extent, Navy and shipyard personnel during the 1940s through the 1970s typically were exposed to meaningful amounts of inhalable asbestos dust onboard ships?**

5. I have based my professional opinions contained in this report on my Navy and professional knowledge arising from my training, education, and experience as a scientist, physician, and, now retired, senior United States Navy officer, as well as my extensive research regarding the knowledge of, and response to, asbestos hazards within the Navy and shipyards specifically, and more generally within the scientific and medical communities at large.

MISSION AND ORGANIZATION OF THE US NAVY AND NAVY MEDICAL DEPARTMENT

6. Although the wording of the mission has changed and evolved over time, the Navy currently describes its mission as the following:

> ***"The mission of the Navy is to maintain, train and equip combat-ready Naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas."*** (USN, 2010)

The Navy's mission is carried out as an integral part of the overall strategy of the Department of Defense:

> ***"Current U.S. defense strategy calls for continuing to shape the strategic environment to advance national interests, maintaining the capability to respond to the full spectrum of anticipated current threats, and preparing for the threats of tomorrow. Implementation depends on the fundamentals of military power: quality people, ready forces, and superior organization, doctrine, and technology. The challenge is to construct an effective defense establishment with limited financial resources in accordance with Department of Defense guidance."*** (NAS, 1998)

In order to fulfill its mission, the Navy must be authorized the funds and personnel to develop and maintain resources – the technology, equipment, conditions – to enable its forces. The Navy maintains a ready and capable force in mind, spirit, and equipment so that personnel are able to respond, when called upon, to a variety of events. In addition to actual combat with a hostile enemy, the Navy must also be able to respond to natural disasters, humanitarian situations, and political events. When not responding to actual combat, the Navy devotes its assets (people, equipment, and funds) to maintaining a state of preparedness and readiness which allows it to be adroit in responding to any mission. Whether at war or in peace, the Navy is always engaged in or preparing for its role in National defense.

7. The ultimate role of the Navy is the projection of force upon the seas as the naval warfare service branch of the armed forces. To this end, the Navy must maintain a constant state of readiness. This is achieved through the maintenance and preparation of ships, aircraft, and equipment, and supporting the shore activities, as well as the personnel manning and operating these activities. The preparation is accomplished through such activities as maintaining and repairing ships, aircraft and other equipment; health promotion and maintenance; equipping and training personnel; developing new technologies – both defensive and offensive; logistics; and budgeting. Without logistics and other support activities, combatant forces (ships, aircraft and personnel) cannot sustain a mission.

8. Even before the United States entered WWII, the Navy Medical Department's express mission was:

> ***"To keep as many men at as many guns as many days as possible."***
>
> (BuMED, 1941)

Currently, this mission statement is not as "combat specific" as manning guns, but still the Navy's Medical Department's primary mission is stated as:

> ***"OUR MISSION IS FORCE HEALTH PROTECTION. As the preeminent maritime medical force deployed with our Navy and Marine Corps warriors throughout the world, we are capable of supporting the full range of operations from combat to humanitarian assistance. We are further capable of providing superior state of the art in-garrison health and preventive care for active duty personnel, our families and those who have worn the cloth of our nation – our retirees."*** (BUMED, 2009)

In support of the Navy's mission, the Medical Department promotes and maintains the health of personnel through the care and treatment of sick and injured members of the Naval service and its civil service employees; prevention and control of diseases and injuries; promotion of physical fitness; as well as performing training and research programs. If people cannot operate the equipment or otherwise perform their duties, ships could not get underway, aircraft could not fly, and other vital operational aspects of the Navy's mission could not be performed in support of national defense.

9. Under civilian leadership (the President, the Secretary of Defense, and the Secretary of the Navy), the Chief of Naval Operations (CNO) is the senior Naval officer with responsibility for every aspect of the overall operations of the Navy. The CNO is a four–star admiral and is responsible to the Secretary of the Navy for the command, utilization of resources, and operating efficiency of the operating forces of the Navy and of the Navy shore activities assigned by the Secretary. As a member of the Joint Chiefs of Staff (JCS),

the CNO is the principal Naval adviser to the President and to the Secretary of the Navy on the conduct of war and is the principal adviser and Naval executive to the Secretary on the conduct of activities of the Department of the Navy. Assistants include the Vice Chief of Naval Operations (VCNO), the Deputy Chiefs of Naval Operations (DCNO), the Assistant Chiefs of Naval Operations (ACNO), and a number of other ranking officers. These officers and their staffs are collectively known as the Office of the Chief of Naval Operations (OPNAV). In addition to the "war fighting members" of the office of CNO, the Navy Surgeon General (SG) and others, such as the Chief of Chaplains and Chief of Information Dominance, also serve to advise the CNO in matters under their cognizance. The SG serves a dual role in the Navy as both the principal advisor to the CNO on medical matters and also the head of the Navy's medical department (Chief, Bureau of Medicine and Surgery (Ch, BUMED)). The CNO may consult with the SG on medical matters; however, the final determination on overall operational strategy and mission achievement rests solely with the CNO (subject to consent of civilian leadership) (USN, 2010).

10. Prior to the 1970s, the Navy's health and safety functions were separately operating components. This initially started in 1917 with the establishment of the safety engineer at shipyards, and then later with the establishment of medical officers at shipyards in the 1920s. The fundamental advisory role of the Navy Medical Department was "medicine" or "health" – not physical safety (such as prevention of trips and falls; "guards" for tool safety). The "Basic Rule of Responsibility" states (CNO, 953):

> ***"Safety is a command function. Responsibility for the safety of personnel is vested in the commanding officer."***

The complete text of this rule not only appears in Chapter 1, but is reprinted on the title page of each chapter of the 1953 "United States Navy Safety Precautions".

11. The Naval chain of command is the Service's delineation of "authority, responsibility, and accountability" extending from top Navy civilian leadership (Secretary of the Navy) through all levels of Naval command or "supervision", and to all Navy personnel. From the day of entry into Navy service, all Navy personnel are taught and must strictly adhere to the chain of command. Using the chain of command, all personnel receive their orders (assignments) and supervision from their immediate senior or "supervisor" in the chain of command. This command structure is important to fulfilling the Navy's mission because it (a) defines authority and responsibility from the most senior to the most junior person in the Service; (b) establishes administration, support, communication, and discipline; and (c) organizes forces to carry out operations. The importance of the chain of command to the Navy's mission is demonstrated by the applicable disciplinary actions for Navy personnel who fail to carry out lawful orders from a senior within the chain of command. A significant breach in the chain of command could endanger personnel or equipment, mission completion or success and, ultimately, the national defense.

12. It is ultimately the Commanding Officer's responsibility to ensure that all personnel and equip-

ment, which includes ships, aircraft, and other physical resources, are prepared to operate and perform their functions in support of their assigned mission. The maintenance of good order and discipline is essential to the Commanding Officer's ability to meet his/her responsibilities. If Navy personnel do not follow the military chain of command and perform duties as directed by his/her operational superior, or if civilian "third-parties" are permitted to interfere with the Navy command structure, Navy operations and mission could be endangered. This is simply because the Commanding Officer would not have confidence that his/her orders would be followed and, ultimately, that the Navy's mission objectives would be met.

13. As I discuss more fully below, the Navy established a comprehensive occupational health program that operated within the overall chain of command to communicate medical and hazard information. Whether onboard combatant vessels or in Navy yards or other shore facilities, the Commanding Officer is charged with protecting the health of all Naval personnel and civilian employees (as appropriate) under his/her command. Navy Medical Department officers working under a Commanding Officer have the responsibility for identifying and communicating information regarding occupational health hazards.

HISTORY OF KNOWLEDGE AND CONTROL OF ASBESTOS HEALTH HAZARDS BY THE US NAVY, AND IN US SHIPYARDS

14. With respect to naval and maritime activities, as well as general industry in the United States, the US Navy and the US Public Health Service (USPHS; PHS) have cooperated in evaluating asbestos expo-

sures and developing exposure control methods for almost three-quarters of a century. The US Public Health Service was established by Congress in 1798 as the provider of health services for the US Merchant Marines – initially as the Marine Hospital Service; later the Public Health and Marine Hospital Service; and currently the Public Health Service. At the request of the North Carolina State Board of Health and their Industrial Commission, the US Surgeon General assigned Dr. WC Dreessen and his co-workers from the Public Health Service to perform the first such evaluation of the developing asbestos textile industry in the United States. (Dreessen, 1938). Dr. Dreessen, together with another senior physician in the Public Health Service, Dr. RR Sayers, disseminated these findings at the American Public Health Association meeting in 1938, and later published them in the *American Journal of Public Health* in 1939 for the general scientific and medical communities. Later, at the joint request of the US Navy and the US Maritime Commission, Dr. Dreessen worked with Prof. Philip Drinker and Dr. WF Fleischer, a Navy physician, on an asbestos exposure evaluation and development of asbestos exposure control methods and medical practices for employees at a private US shipyard. (Dreessen and Fleischer, 1944) A discussion of "what and when" the US Navy was aware of regarding the health hazards associated with asbestos and the need to control exposure to airborne asbestos fibers is thus forever intertwined with the "what and when" of the US Public Health Service's parallel awareness and understanding regarding the protection of the health of the general public – and civilian mariners.

15. The Navy's development of nuclear power for ship propulsion systems in the late 1940s led to a close working relationship and the sharing of information between the US Navy and the US Atomic Energy Commission (AEC) – as well as the Public Health Service. The AEC later "evolved" into the Nuclear Regulatory Commission (NRC), the Energy Research and Development Administration (ERDA), the Department of Energy (DOE), and the National Nuclear Security Administration (NNSA). These organizational entities always had a close working relationship with the Navy's Bureau of Ships (BuSHIPS) and the Office of Naval Reactors. A close relationship still exists today between the US Navy and non–Navy ("civilian") Governmental Departments and Agencies through the Navy–Department of Energy Naval Nuclear Propulsion Program. A working relationship also existed between major US Governmental Departments and Agencies and the energy utilities with respect to occupational health and safety. This relationship was enhanced by the presence of two notable individuals: Admiral HG Rickover, USN and HE Stokinger, PhD. ADM Rickover served in joint and overlapping assignments with the US Navy and the early AEC—such as in his roles in the Division of Reactor Development at the AEC and as Director of the Naval Reactors. These roles led to his direct involvement with both the development of the Navy's first nuclear-powered vessel, the submarine USS NAUTILUS which was commissioned in 1954, and also the Shippingport Atomic Power Station which powered up on December 18, 1957 as the first commercial, pressurized water reactor nuclear power plant. Dr. Stokinger served initially in the Industrial Hygiene Section on the Manhattan

Project with the Atomic Energy Commission, and later, in 1951, be became the Chief Toxicologist for the newly created Division of Occupational Health of the US Public Health Service. Dr. Stokinger continued with the Public Health Service until well after the enactment of the Occupational Safety and Health Act in 1970 and the establishment of the National Institute for Occupational Safety and Health (NIOSH). He served on the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) Committee for twenty- five years—fifteen of those years as the Chair. The US Navy had representation in the ACGIH and also on the TLV Committee. As discussed throughout this report, the Navy's knowledge of the applications and hazards of asbestos represented what was available and known by other Federal Departments and Agencies

16. The Navy and the Maritime Commission's use of asbestos onboard ships generally, and on steam systems specifically, was not by chance, nor based on any requirements of the Navy's equipment manufacturers and vendors. The use of asbestos was based upon necessity. Due in large part to the association of one notable individual, Professor Philip Drinker of the Harvard School of Public Health – and who also served as the Chief Health Consultant for the US Maritime Commission, the knowledge and experience possessed by the Navy regarding the use of asbestos since its early use in steam–generating systems, as well as the hazards and means of controlling those hazards, was shared and held by other Federal Departments and Agencies. As discussed in their landmark paper addressing the use of asbestos in the Navy, Fleischer

and coworkers (1946) wrote with the permission of the Navy:

> ***"An important ingredient of pipe covering material used on U.S. Navy vessels is amosite . . . . The chief reasons for the wide use of amosite felt and pipe covering in naval work are its low thermal conductivity, light weight, strength and refractoriness. When the felt and pipe covering were first developed, we were still building vessels under the Washington Treaty of Limitations in Tonnage, and every pound saved meant that much more armor, guns or ammunition for a given displacement, to say nothing of more economic operation for the weight involved in insulation.***
>
> ***Amosite pipe covering weighs about 14 pounds per cubic foot, with a temperature limit of 750 F, as compared to magnesia with a weight of 16 pounds per cubic foot, and a temperature limit of 500 F, High temperature amosite pipe covering weights about 18 pounds per cubic foot as compared to 26 pounds per cubic foot for other high temperature insulations. Because of the lower conductivity and the higher temperature limit of the amosite type, less of it need be used in combination covering than other types of insulations.***
>
> ***The development of amosite felt started in 1934 when a need existed to secure a thermal insulation lighter in weight and thermally more efficient than the materials (blocks and cement or asbestos blankets)***

which were then being used on destroyer turbines. The Navy approved the type developed by a manufacturer in September, 1934. Originally amosite was used only for turbine insulation, but it proved so satisfactory that its field of application enlarged to include insulation of valves, fittings, flanges, etc. From the initial destroyer, it has been used on almost all the destroyers built since that time and on all other combat vessels built since before the War.

Pipe covering was a later development in late 1935 and early 1936. Due to the manufacturing problems involved, it took a longer time to evolve into a satisfactory shape, and its first use on naval vessels was in 1937. Since that time its use has spread markedly and it was used on the great majority of naval combat vessels built during World War II.

Water-repellent amosite felt was developed during the early part of 1942, as a replacement for hair felt in the insulation of cold water lines to prevent sweating. Hair felt had the disadvantage of being combustible and as it was organic, when it became wet it moulded or rotted and could harbor vermin. At this time fires on board certain naval vessels convinced the Navy of the desirability of eliminating any combustible material from on board ship. Eventually water-repellent amosite was made in strips of 50 foot lengths and of suitable

> ***width to enclose the circumference of the pipe and enclosed in an extremely light-weight muslin to facilitate handling and reduce the dust, which the water-repellent agent accentuated."***

17. The US Navy and the US Maritime Administration ("MARAD"; the US Maritime Commission became MARAD under the Department of Commerce in 1950 when its Government-owned shipping interests and operations transferred to this newly-established Administration) specified the types of thermal insulation and lagging for piping and machinery, as noted in the military specifications used for vessels constructed under US Navy and the Maritime Administration contracts for boilers, machinery and piping (MIL-B-18381(SHIPS) (Boilers, Steam, High Pressure Naval Propulsion) and (MIL-STD-769 (Military Standard – Thermal Insulation Requirements for Machinery and Piping)), and for steam propulsion turbines (Mil-T-17600 series (Turbines, Steam, Propulsion)) for vessels built under contract for the US Government. In accordance with these military specifications and the specific contracts that I have seen, external thermal insulation for equipment like boilers and turbines, and the associated appurtenances and piping is provided initially by the shipbuilder, and later upon maintenance or overhaul, the external insulation is provided by the activity performing the work – the Navy or shipyard/repair facility – in accordance with Navy specifications. The composition and thickness of external thermal insulation, if required by Navy specifications for a specific thermal application of a valve or fitting, are provided in the "General Specifications for Machinery of Vessels of

the United States Navy" (Section S39-2; 1951; later Chapter 39 Bureau of Ships Technical Manual of 15 April 1959 and Chapter 9390 of the same Manual dated 5 Jan 1965) (BUSHIPS, 1951; 1959; 1965). The General Specification, dated 8 December 1951, specifically addresses the type and thickness of external thermal insulation (block, felt, and blanket) applied to turbines and other equipment and serves as the basic reference for ship design, building, and repairing activities. It would also be the basic reference cited in an equipment manual. Starting in the mid–to–late 1960s, the Navy specifications for the composition of thermal insulation materials changed – some asbestos-containing thermal insulation materials were no longer used, while the asbestos content of others was reduced. (Turnbull, 1969; OiC NAVSEC, Philly, 1969; COMNAVSEC, 1971; COMNAVSHIPSYSCOM, 1971; COMNAVSEC, 1972; COMNAVSEASYSCOM, 1975) During this period of time, additional Federal, as well as Navy, safety and health requirements were enacted to control the exposure to airborne asbestos fibers and meet Federal pollution control statutes.

In addition to thermal insulation, the US Navy also specified the types and styles of materials which were used for packing and gasket applications, as well as the types and applications of electrical products used on vessels of the US Navy. The packing and gasket specifications, and their unique Navy symbols which are used to identify and order approved products for specific applications, are given in the "Standard Plan Application of Packings and Gaskets" (Bureau of Ships, Navy Department, 1945), and are discussed in Chapter 95 of the "Bureau of Ships Technical Manual (NAVSHIPS 250-000; Chapter 95; 1959). Packings and gaskets were specifically required by paragraph 95.3: "PROPRIETARY BRANDS, AVOID REFERENCE TO" and reads:

> ***"Packing and gaskets shall be ordered by Navy symbol number or applicable specification, and not by brand name."***

The use of non-friable asbestos-containing materials in gaskets, packings, wire and cable, as well as in other Navy electrical system applications where the asbestos was "embedded" and not friable, did not present an "inhalation exposure hazard" to asbestos fibers under normal conditions of handling and use. This determination was based upon data and professional opinions dating back to World War II, and reconfirmed through the work of more current investigators. (Liukonen et al., 1978; Mowat et al., 2005; Williams et al., 2007)

The Occupational Health and Safety Administration (OSHA) and the US Environmental Protection Agency (EPA) interpret the term "friable". Under OSHA, "friable" is defined as:

> ***"C. The potential for an asbestos-containing product to release breathable fibers depends largely on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. The fibrous fluffy sprayed-on materials used for fireproofing, insulation, or sound proofing are considered to be friable, and they readily release airborne fibers if disturbed. Materials such as vinyl-asbestos floor tile or roofing felt are considered non-friable if intact***

> ***and generally do not emit airborne fibers unless subjected to sanding, sawing and other aggressive operations. Asbestos-cement pipe or sheet can emit airborne fibers if the materials are cut or sawed, or if they are broken."***

A similar definition is used by the EPA under the "National Emission Standards for Hazardous Air Pollutants" (NESHAP) regulations initially published in 1973:

> ***"Friable asbestos-containing material (ACM), is defined by the <u>Asbestos NESHAP,</u> as any <u>material containing more than one percent (1%) asbestos</u> as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, Polarized Light Microscopy (PLM), that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure." (Sec. 61.141)*** [EMPHASIS ADDED]

When the health standard for asbestos enacted under the Occupational Safety and Health Act of 1970 was published separately as the "Asbestos Standard" in 1972, the requirements for labeling or a warning notification did not apply to all asbestos-containing products – it excluded non-friable asbestos-containing materials such as these (DoL, 1972):

> ***"(2) Caution labels—(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, <u>except that no label is required where asbestos fibers have been</u>***

> ***modified by a bonding agent, coating, binder, or other materials*** ***so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation,*** ***no airborne asbestos concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.”*** [EMPHASIS ADDED]

Section (b) of this 1972 Standard reads:

> ***“(b) Permissible exposure to airborne concentrations of asbestos fibers— (1) Standard effective July 7, 1972. The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.”*** [EMPHASIS ADDED]

As defined under OSHA and the EPA, it is not the mere presence of asbestos in a material – it is the so–called “asbestos-containing material” or “ACM” which is regulated by the material’s asbestos content (greater than 1%) and potential to release airborne asbestos fibers (greater than 5 microns in length) in excess of the asbestos PEL. The representation and claim that an individual was “exposed to asbestos” based solely upon a material’s composition is non-sensical in terms of scientific or probabilistic reality - and under reasonable thinking.

18. The United States Navy recognized that the inhalation of asbestos fibers in sufficient amounts

(dose = concentration x time) could result in pulmonary disease since at least the early 1920s and had an active program to identify hazardous exposures and to prevent exposures leading to recognized health effects. In the "Instructions to Medical Officers (Notes on Preventive Medicine for Medical Officers, United States Navy)", asbestos was listed as one of the many inorganic and organic dusts that could cause pulmonary disease. (Dublin, 1922) Dublin also recognized several methods to prevent the inhalation of these dusts including: the use of water to control the release of dust; the use of local exhaust systems to remove the dust at the point of origin; the use of inclosing (sic) chambers; and the use of respirators and helmets. He stated: ***"No one of these can apply to all conditions, but the particular method to be used must be adapted to the peculiarities of the process."*** From the extensive list of inorganic, as well as organic, dusts and ***"occupations which offer such exposure"***, it is obvious that his perception of dust control was based upon the avoidance of recognizable disease, and not the mere presence of a given, or visible, amount of dust being generated.

19. The United States Navy expanded the scope of its asbestos hazard control program by including the enlisted corpsmen of the medical department in the hazard control process. In the "Handbook of the Hospital Corps" (United States Navy, 1939), the Bureau of Medicine and Surgery discussed the organization used for disease and injury prevention in the United States Navy, and took a lead position in the prevention of industrial diseases:

> ***"The government having passed such laws must therefore lead the way in protecting***

its own employees . . . . An organization has been set up in the Navy to protect its personnel, both civilian and naval, a safety engineer is provided, who acts directly under the Assistant Secretary of the Navy. He has supervision of the safety precautions taken to protect the civilian employees in the navy yards, ammunition depots, torpedo stations, and the like. He is also a consultant in all matters pertaining to safety aboard ships, at training stations and other Navy Department activities. A naval medical officer is assigned to his office for the purpose of consultation in all matters pertaining to health and safety and to cooperate in devising means by which health may be protected and accidents prevented. Aside from this particular medical officer, all medical officers, dental officers, members of the Hospital Corps and nurses form the balance of the medical staff of this organization. It is essential that each of these members know and understand the hazards to be encountered in the Navy, the steps to be taken to protect against injury and disease, the treatment of diseases and injuries arising therefrom and the organization of medical personnel for such purposes. Naval medical personnel are required to perform duties ashore, at sea, in foreign countries, in the air and under the sea. In each of these places a variety of health hazards exist. It is therefore necessary that these personnel *have a thorough knowledge of the industry to which they are attached, the hazards presented, the methods of prevention and the treatment of all injuries occurring.*

In all navy yards, the Commandant is the head of the organization. He is responsible to the Navy Department for the protection of the employees, as well as the naval personnel, under his command. He is familiar with the nature of the work being performed by the employees at his station and on the health and accident hazards presented. Accordingly, he appoints, as the working head of the organization, a safety officer or a safety engineer, as he is better known. The safety engineer must be of sufficient rank to have become familiar with the various trades in a navy yard, a knowledge of machinery, a man of cooperative ability and well liked, and having sufficient knowledge of safety devices and appliances to intelligently make inspections and recommend proper protective measures. His duties are primarily, to prevent accidents and promote healthy working conditions. It is his duty to inspect all working places, make a general survey of all mechanical conditions and to recommend the addition of all necessary safety appliances for the protection of the workers.

The Commandant further assigns a medical officer to act as advisor to the safety engineer. The medical officer must be of

> ***the same qualifications as the safety engineer, with the addition that he must be thoroughly versed in the diseases connected with Industry . . . It is well for members of the Hospital Corps to understand the nature of these duties in order that they may be of assistance to him in the performance of these duties: . . . He acts as consultant to the safety engineer in all matters pertaining to the general welfare and health of the employees. Hygiene and sanitation are his important duties. He must interest himself in the employees and instruct them in the everyday principles of personal hygiene and self preservation. He must instruct the employees in safety measures and encourage them to cooperate in protective measures. They must be made "safety conscious" or "safety minded". The morale must be kept up....***
>
> ***The medical officer must inspect all working places in order to have a better understanding as to the actual conditions under which the men work. He must make appropriate recommendations to improve deficiencies noted and must then see that these recommendations are carried out."***

The text further notes that the safety engineer is assisted by other personnel:

> ***"The safety engineer is assisted in his work by the foremen of the shops and in some instances by safety committees in each shop elected by the employees. These men or committees are generally chosen from***

> ***among the older employees and from men who have considerable experience in their trade . . . The organization of the medical advisor is composed of junior medical officers, dental officers, to some extent, members of the Hospital Corps, and of nurses. The duties of the hospital corpsmen are to assist the medical officer in his inspections, assist in the treatment of the injured and to prepare the necessary reports and returns in cases of accident, occupational disease, and the physical examination of employees."***

A similar organization is described for ***"... a battleship or in other places."***

To this end, the enlisted Hospital Corpsmen were informed of the hazards presented by asbestos and instructed to ***". . . locate these hazards and afford protection accordingly."*** Two of the hazards that the Hospital Corpsmen were specifically instructed to evaluate in a questionnaire (inspection or survey form) were:

> ***"What precautions are exercised to prevent damage from pipe covering compounds?"***
>
> ***"What asbestos hazards exist?"***

Also, the Hospital Corpsman was instructed to help keep the workforce healthy:

> ***"Proper working places must be provided and maintained. Hygienic and sanitary conditions must be kept on a high plane. All moving parts of machinery must be***

> ***guarded, goggles provided for workers required to use them; helmets and masks for sand blasters; proper ventilation for the chrome workers; masks for asbestos workers; protection for workers in x-ray and radium; protective gloves, shoes, and other garments for foundry workers, and other means of protection too numerous to mention here must be available and used. Special physical examinations must be made of all sand blasters, asbestos handlers, those exposed to radium and its compounds, lead workers, those engaged in dusty or smoky trades, handlers of T.N.T. and other explosives, etc., to prevent the occurrence of the diseases associated with those trades from injuring the men."***

20. This type of active assessment, evaluation, and recommendation for control was embraced by senior United States Navy officers. In his memorandum to the Manager of the Navy Yard, Boston, Captain HE Jenkins, MC, USN (Jenkins, 1939) discussed his findings and recommendations from his survey of the pipe covering shop and work shack at that yard. Although he stated that the health hazards to personnel were very remote, based upon his evaluation of the amount of dust released, Captain Jenkins recommended that a dust respirator and gloves be worn to supplement the ***"conscientiously and intelligently enforced"*** practice of wetting down insulating material. Captain Jenkins also addressed the impractical use of respirators during shipboard lagging operations and recommended sufficient wetting to prevent dust generation as far as practicable. Less than one week later, CDR

CD Headlee, USN (1939), issued a "Production Division Notice (Number 996)" implementing these recommendations. Captain EW Brown, MC, USN (1941), in the "Annual Report of the Surgeon General, US Navy to the Secretary of the Navy" and in the scientific publication of his presentation made to the Fifth Annual Meeting of the Air Hygiene Foundation of America (1941), discussed the findings of his medical survey at the New York Navy Yard. Captain Brown, recognized as the founder of the Navy's formal occupational health program, assessed asbestos exposure and medical findings of eleven workers at the New York yard. With knowledge of occupational exposure to silica and its delayed clinical findings, and under the conditions that he observed, Captain Brown found no indication of pulmonary disease in these workers at that time. He noted that wet methods and local exhaust ventilation were implemented, and that the workers wore a respirator ***"during the dustiest aspect of the process."*** He stated that similar findings were reported in two other yards and recommended that the study be extended to all men in this trade. These references further demonstrate that senior Navy personnel actively monitored and controlled the Navy policy regarding disease and injury prevention, and were indeed the leaders in field assessment and control of occupational health hazards, including asbestos.

21. When quantitative assessment (counting) of asbestos particles in air was available, the Navy followed the recommendations of the United States Public Health Service. Based upon the findings of Dreessen and coworkers' (1938) study of asbestosis in the textile industry prepared by direction of the United States Surgeon General, the United States

Navy accepted an exposure level of 5 million particles per cubic foot (5 MPPCF) as the time-weighted average (TWA) for occupational exposure. Dreessen and coworkers concluded:

> ***"It would seem that if the dust concentration in asbestos factories was kept below 5 million particles (the engineering section of this report has shown how this may be accomplished), new cases of asbestosis would probably not appear."***

This TWA is the average airborne concentration of asbestos particles to which an individual could be exposed in an eight hour period. Shorter periods of higher concentrations were acceptable as long as the average exposure calculated over eight hours did not exceed the TWA.

22. As Navy Medical Department personnel, when Captains Jenkins and Brown encountered asbestos exposure conditions that were not fully satisfactory and required changes, they made recommendations for correction of the exposure conditions to higher line (command) authorities. In both of these instances, only a qualitative assessment was made and actual exposure levels were not determined. Captain Brown (1941) performed a further medical assessment and found no significant clinical findings in the limited number of workers observed during the relatively short, post-exposure period. The Navy's occupational health program was based upon internal support for the identification and control of occupational health hazards. In order to develop a sufficient cadre of physicians and scientists, the Navy developed training programs with Columbia University's Delamar Institute of Public Health and the Harvard

School of Public Health. By the end of World War II, over one hundred physicians, scientists, and engineers had been trained in occupational health at these two leading institutions of US public health.

23. In 1936, the United States Congress recognized that it was in the national interest to build and maintain a strong merchant marine fleet and passed the Merchant Marine Act in 1936 (US Congress, 1936) in order:

> ***"To further the development and maintenance of an adequate and well-balanced American merchant marine, to promote the commerce of the United States, to aid in the national defense..."***

To this end, Title 1: Declaration of Policy; Section 101 of this Act establishes the policy of the US Government in maritime matters:

> ***"It is necessary for the national defense and development of its foreign and domestic commerce that the United States shall have a merchant marine***
>
> ***(a) sufficient to carry its domestic water-borne commerce and a substantial portion of the water-borne export and import foreign commerce of the United States and to provide shipping service on all routes essential for maintaining the flow of such domestic and foreign water-borne commerce at all times***
>
> ***(b) capable of serving as a naval and military auxiliary in time of war or national emergency,***

(c) owned and operated under the United States flag by citizens of the United States insofar as may be practicable, and

(d) composed of the best-equipped, <u>safest, and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel</u>. It is hereby declared to be the policy of the United States to foster the development and encourage the maintenance of such a merchant marine." [EMPHASIS ADDED]

24. The "Minimum Requirements for Safety and Health in Contract Shipyards" ("Minimum Requirements") were drafted in 1942 by representatives from labor management committees, labor unions, management of private shipyards, insurance companies, the United States Maritime Commission, and the United States Navy. When approved by the US Navy and the US Maritime Commission in early 1943, compliance with these standards was expected in shipyards:

"Each contractor is hereby given notice that the Navy Department and the Maritime Commission will expect full and complete compliance with the minimum standards which bear the approval of the Navy Department and Maritime Commission, and each is requested to give full cooperation to the consultants on health and safety who will be charged with the coordination and supervision of the safety and health program of the two agencies.

H-13. A Guide for Prevention of Industrial Disease in Shipyards

13.1 Eight common types of disease and methods for their prevention are given in the following sections. Help in applying these methods will be given by the local Safety Department and by safety and medical consultants of the Navy Department and the Maritime Commission.

** * * * **

13.7 Asbestosis

a. Sources: In general, any job in which asbestos dust is breathed. For example:

1) <u>Job:</u>	***2) <u>When Material Is:</u>***
3) Handling	***4) Asbestos***
5) Sawing	***6) Asbestos mixtures***
7) Cutting	***8)***
9) Molding	***10)***
11) Welding rod salvage	***13)***
12)	

b. Job can be done safely with:

1. ***Segregation of dusty work and,***
2. ***(a) Special ventilation: hoods enclosing the working process and having linear air velocities at all openings of 100 feet per minute, or***

   (b) Wearing of special respirators
3. ***Periodic medical examination"***

25. Less than six months after these "Minimum Requirements" were issued, the Secretary of the Navy (Forrestal, 1943) reaffirmed these requirements for all private shipyards having Navy contracts. Although the "Minimum Requirements" did not provide a specific occupational exposure value for asbestos, they gave general requirements for safe (healthful) shipyard operations. The Navy's occupational health team was responsible for assisting in interpreting the standards for implementation at Navy and contract yards throughout the country. Any significant inspection findings, whether favorable or adverse, were to be discussed first with the shipyard management, thus allowing management the opportunity to take corrective action for imminent dangers. The actual written report was to be submitted in draft form to the regional director of the Maritime Commission for final typing. Until the enactment of OSHA, these early nationally recognized safety and health standards initiated under the "Minimum Requirements" continued in effect at private US shipyards through the updated requirements of the Walsh–Healey Public Contracts Ad. (US Cong, 1936) and the "Safety and Health Regulations for Ship Repairing" (DoL, 1960).

26. In addressing exposure to asbestos, Philip Drinker, then Chief Health Consultant for the United States Maritime Commission, and Professor in the Harvard School of Public Health program that was training the Navy physicians, scientists, and engineers, recommended an occupational exposure level of 5 MPPCF (Drinker, 1944). This is the same value as recommended by Dreessen and coworkers of the US Public Health Service (1938) to prevent the development of disease. The shared and jointly-held

knowledge among various Federal Departments and Agencies regarding asbestos health hazards, as well as the need and methods to control these hazards were well-established.

27. In January, 1945, Philip Drinker (1945) informed Captain TJ Carter, MC, USN, Bureau of Medicine and Surgery, of a potentially serious health risk from asbestos dust exposure at the Bath Iron Works. He was concerned that similar risks might be found in other yards where the same type of pipe covering was used. In this letter, Professor Drinker stated that the manufacturers of the asbestos insulation materials used at Bath would:

> ***". . . be glad to get out a brief statement of precautions which should be taken in light of their own experience and that they would inform their competitors that I had asked them to do so. I understand that neither the Navy nor Maritime wants any change in the specifications as the performance with the present materials is entirely satisfactory. From a health standpoint we do not believe any specification changes are needed."***

Drinker recommended that a study be performed to evaluate asbestos exposure and disease among workers, and stated that ***"Admiral Mills agreed that such studies would be wise before Navy or Maritime accepted this asbestosis risk as being significant in our general ship construction program."*** Four shipyards in the Northeast, two contract yards (New York Shipbuilding in Camden, NJ and Bethlehem Steel Fore River in Quincy, MA) and two US

Navy yards (Boston NSY and Brooklyn NSY), were selected for this study of exposure levels and health status; additional dust exposure data were provided by the Portsmouth Naval Shipyard. The study, conducted by Fleischer, Viles, Gade, and Drinker–also called the "Fleischer-Drinker study" – was promptly undertaken and reported in September, 1945 (Fleischer et al., 1946). The results of this study reaffirmed the Navy's position on adherence to an occupational exposure level of 5 MPPCF. The conclusions were:

> ***"1. The character of asbestos pipe covering on board naval vessels is such that conclusions drawn from other asbestos industries such as textiles, cannot be applied.***
>
> ***2. The operations of band saw cutting, grinding, cement mixing, and installation aboard ship should be equipped with exhaust ventilation to keep the total dust concentration low.***
>
> ***3. The incidence of asbestosis among pipe coverers in the shipyards studied was low, 0.29 per cent or 3 cases out of 1074.***
>
> ***4. Since each of the 3 cases of asbestosis had worked at asbestos pipe covering in shipyards for more than 20 years, it may be concluded that such pipe covering is not a dangerous trade."***

The results of this well-designed study, measuring actual asbestos exposure values and performing health assessments on the exposed workers, became established as Navy policy. The Navy adopted a recommended "maximum allowable concentration (M.A.C.)"

value for asbestos of 5 MPPCF. This was the same value discussed by Dreessen and coworkers (1938) when assessing the asbestos textile industry with much longer daily exposure periods and primarily the chrysotile type of asbestos. It is also the value recommended by the National Conference of Governmental Industrial Hygienists in 1942, and later adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) in 1946. Among the members of the ACGIH in 1946, a private professional organization which did not offer membership to individuals affiliated with industry, were three representatives of the Navy Department and forty-two representatives from the United States Public Health Service. At this point in time, Professor Drinker was an associate member of the ACGIH representing one of the educational institutions – Harvard University. Since there were no federal, state, or local occupational exposure standards, the Navy used the occupational exposure level that the best scientific and medical evidence supported. In 1955, the Navy adopted the 'Threshold limit values for toxic materials" developed by the American Conference of Governmental Industrial Hygienists as a basic reference and ***"to provide guidance toward the reduction of potential health hazards encountered in the industrial environment for both military and naval civilian personnel."*** The Navy (BUMED, 1955) recognized that:

> ***"[The] threshold limit values should be used as a guide in the control of health hazards and should not be regarded as fine lines between safe and dangerous combinations. The most desirable levels in all cases are those approaching zero, but***

> ***practical considerations frequently require the acceptance of higher levels which are safe, but not ideal."***

Moreover, the Navy recognized that:

> ***"[The] threshold limit values . . . are based on the best available toxicological information, long-term industrial experience, and experimental studies. In as much as these values are constantly being reevaluated, revisions or additional will be made as further information becomes available."***

28. The "Bureau of Ships Technical Manual, Chapter 51: Boilers (BuSHIPS, 1955)" addresses the engineering and operating aspects of boilers and establishes Navy policy in these areas. Although this official publication does not address all medical aspects of the Navy's occupational health program, in Section 51-43, it specifically states precautions for work inside the furnace of a steam generator under "Examination and Cleaning of Firesides":

> ***"The use of a respiratory mask for toxic dust during cleaning operations is required to prevent any toxic effect of the dust on personnel."***

This brief note of requirement did not discuss the various components of the toxic dust – nor all aspects of the Navy's occupational health program discussed above. From the industrial hygiene perspective at the time, the primary dusts of concern in the furnace of a Naval steam generator were crystalline free silica and carbon/carboniferous residue from the incomplete combustion of fuel; other less significant particulates included metallic oxides, asbestos, and asbestos decomposition products. The requirements for a Navy gas-free engineer to assess and authorize controlled entry with appropriate safety equipment into a closed space, such as tanks, voids, and "cold" boilers, is contained in The "United States Navy Safety Precautions, OPNAV 34P1" (CNO, 1953).

29. The Commander, Long Beach Naval Shipyard, and his management, production, and medical staffs, including the Industrial Hygiene Department, were exemplary in controlling occupational exposures through direct involvement and coordination with civilian shipyard workers, organized labor officials, and the Commanding Officers and crews onboard ships undergoing maintenance and repair. In May 1947, CAPT TP Wynkoop, USN, the Shipyard Commander, wrote an open memorandum for "Commanding Officers of Ships" regarding "Safety practices of fleet personnel at this Shipyard" (Wynkoop, 1947). This Memorandum was later published in the Navy-wide publication: "Safety Review" in July, 1947, and states:

> ***"In accordance with instructions, issued by the Bureau of Ships and the Office of Industrial Relations in the Secretary's Office, it is requested that commanding officers of ships in the shipyard take steps to insure that military personnel aboard their ships conform to Shipyard safety practices when performing work within the Shipyard. The Safety of naval personnel is no less important than that of civilian personnel."***

To this end, CAPT Wynkoop established a liaison between each ship's force via an appointed safety officer and the Yard Safety personnel; provided for a visit by a Yard Safety inspector upon arrival in the Yard to deliver and discuss pertinent safety orders; provided for additional consultation and advice via the Yard's Safety Superintendent; and made the loan of safety equipment, including respiratory protection, available to ships. He additionally wrote:

> ***"Commanding officers are urged to make full use of available safety equipment and technical advice in performing ships force work to the end that accidents to naval personnel may be minimized, if not eliminated within the shipyard."***

The level of occupational safety and health leadership and involvement demonstrated by this Shipyard continued with many highpoints. Mr. OW Meeker (Master, Shop 56, Long Beach Naval Shipyard) told the assembled representatives of the major Navy shipbuilding and repair facilities at the First Shop 56 Masters' Conference of Pipe and Copper Shop Master Mechanics' Conference held at the Boston Naval Shipyard in May, 1957 (Meeker, 1957), that he, even as a nonmedical professional, recognized the potential hazard of prolonged inhalation of significant concentrations of airborne asbestos fibers:

> ***"The most apparent symptom of asbestosis is lethargy or a lack of vitality. What we suspect to be lead in the posterior might well be asbestos in the lungs.***
>
> ***. . . Remove the cause by substituting other products such as Armaflex and StaFoam for asbestos whenever possible. However, this will take some doing.***

> ***In the meantime, the answer is wearing of respirators by all who handle asbestos products. To many the very idea of wearing respirator (sic) is repugnant. However, a respirator on the face is preferable to asbestos in the lungs. Therefore, gentlemen, ours definitely is the important and difficult task of providing and installing effective insulating materials aboard Naval Vessels. Moreover, this task must be accomplished without sacrificing our workmen in the process."***

A Navy study of pipecoverers performed by the Industrial Hygienist at this same shipyard and reported in January, 1959 (Anon, 1959), concluded:

> ***"The work habits, personnel protection and working environment of these men are not of desirable standards. These conditions, plus their increasing years of exposure and the medical study, indicates the need for corrective action."***

In order to achieve compliance with existing Navy occupational health policy, the Secretary for the Asbestos Union at Long Beach Naval Shipyard (Local #20), Mr. Webster Ay, was kept involved with asbestos program developments throughout this period of time. In an April 1957, letter from the Yard Industrial Hygienist, Mr. JR Sheehan, Mr. Ay was informed about medical developments to maintain and improve the health of workers in the "dusty trades", and his cooperation was sought (Sheehan, 1957). The use of ventilation and respiratory protection was encouraged for his members. As a demonstration of this cooperation between management and workers, Mr. Ay co-developed the nationally-circulated "Grim Reaper" poster with Mr. CV Krieger, the Shipyard Safety Superintendent (Sickles, 1961):

"Is your FUTURE . . . With Him (the Grim Reaper) . . . Or Them (your Family)? WEAR YOUR RESPIRATOR"

Later, the civilian Navy industrial hygienist at Long Beach Naval Shipyard, Mr. WT Marr, further wrote on the hazards of, and controls for, asbestos insulation work by shipyard insulators onboard ships. (Robbins and Marr, 1962; Marr, 1964) This cooperation between management and labor in promoting worker safety and health reflects the level of involvement between the unionized asbestos workers (Association of Heat and Frost Insulators and Asbestos Workers) who were affiliates of the American Federation of Labor-Congress of International Organizations (AFL-CIO) and the US Government. During this period, the AFL-CIO developed a close relationship with Irving J. Selikoff, MD for the assessment and control of occupational illnesses arising from exposure to asbestos by members of this organization.

30. The recognition of the potential hazard created by exposure to significant concentrations of airborne asbestos fibers was also evident at the Boston Naval Shipyard since the late 1930s. As mentioned above, there is documentation that the senior Navy Medical Department representative at the Boston Naval Shipyard (CAPT HE Jenkins, MC, USN) performed site evaluations to assess inhalation of airborne asbestos fibers as far back as 1939. (Jenkins, 1939) Captain Jenkins noted the use of the ***"conscientiously and intelligently enforced"*** practice of wetting down insulating material in the production

shop. He recommended that this practice be extended to shipboard operations in order to prevent dust generation as far as practicable as the use of respirators was impractical in such settings. The shipyard management agreed and promptly issued a Production Notice which made these medical recommendations mandatory. (Headlee, 1939) As noted above, the Boston Naval Shipyard was one of the two Navy yards surveyed in the Fleischer-Drinker Study published in 1946. The results of this study supported the Navy's program for asbestos control which was aimed at controlling release of asbestos fibers to levels below which were deemed to be hazardous – that is, below 5 MPPCF. The Boston yard continued its contributing role to the Navy's asbestos control program by hosting the "Pipe and Copper Shop Master Mechanics' Conference" at the Boston Naval Shipyard in 1957. Mr. George P. Chamberlain, Master Pipefitter and Coppersmith (Shop 56) at the Boston Yard, served as the Conference Chairman. In his "Travel Report" submitted by Mr. EB Stecher from the Navy Bureau of Ships (Stecher, 1957), Mr. Stecher reflected upon some of the comments made by Meeker, but he felt that compelling workers to wear respirators had been unsuccessful in the past, and that material substitution was the only method which offered complete resolution of the health hazard from asbestos:

> ***"Considerable discussion took place regarding asbestosis (silicosis). This is still an acute problem in many of our Yards. It was pointed out that regardless of the instructions, the insulation men will not wear masks especially when installing insulation aboard ships. The only solution***

appears to be to find an insulation that is not a health hazard."

However, in his statement regarding his idea for resolution of the asbestos inhalation hazard, Mr. Stecher failed to consider the obvious necessity of dealing with the problem at hand – namely, the asbestos-containing materials which were used extensively onboard Navy ships of the era and work which needed to be currently accomplished while providing adequate protection for workers. Meeker also sought suitable replacement materials, but made that consideration when he said:

"In the meantime, the answer is wearing of respirators by all who handle asbestos products. To many the very idea of wearing respirator (sic) is repugnant. However, a respirator on the face is preferable to asbestos in the lungs."

Mr. Ernani Storlazzi, CIH (Retired) in his Declaration dated October 8, 2008, testified that he was initially assigned to the Boston Yard as an active duty Navy officer and that he then continued as a civil service industrial hygienist from 1946 until the Boston Naval Shipyard closed in 1974. During that period dating back to the mid-1940s, he states that information regarding the potential hazards of asbestos and the proper means of control were available to workers in the Boston yard:

"During my entire tenure at the Boston Naval Shipyard, I was mindful of potential asbestos dust hazards. The standard operating practice at the Boston Naval Shipyard was to survey various shops and ships

> ***under repair, including the pipecovering shop, on an intermittent basis. Whenever such surveys revealed potential hazards, the workers and/or their superiors would be advised as to appropriate precautions to take. This included routinely instructing the workers in the pipecovering shop that they should take precautions regarding heavy asbestos dust exposures. This included instructing the workers to utilize respirators, to implement local exhaust procedures and/or to use wet down techniques. In short, the state of the art precautions of the time were communicated to the workers and management in the Boston Naval Shipyard."***

He further adds that such information and programs were widely disseminated throughout the US Naval establishment:

> ***"From my own observations at the Boston Naval Shipyard and from information regarding other shipyards across the country, knowledge regarding the potential hazards of asbestos exposure were well-known throughout the shipyard work force. Undoubtedly, anyone engaged as a pipecoverer should have been well aware of such information, and tradesmen in other occupations had every opportunity to gain similar knowledge. Starting in the earliest years, some of the workers were utilizing respirators. Additionally, starting in the earliest years, some operations would be segregated and marked off to***

> ***keep uninvolved workers away from the potential exposures. By the late 1960s, the vast majority of insulation workers were utilizing dust masks on at least a part time basis. Information regarding asbestos hazards was readily available to anyone in the shipyards. Additionally, over the years, this information had been communicated throughout the Naval community at various levels. I have no doubt that many, many officers and men in the United States Navy were fully informed regarding asbestos dust hazards from the earliest 1940s to all times thereafter.***
>
> ***During my entire time with the Navy, both as a uniformed officer and subsequently as a civilian employee, I believe that I was well informed and well educated regarding my professional field of industrial hygiene. At all times, I felt that I was properly informed regarding the state of the art pertaining to asbestos dust and its potential hazards. Likewise, I believe my colleagues in the Navy, across the country, were similarly well informed."***

Mr. Storlazzi's Declaration is supported by the Memorandum from Mr. GP Chamberlain dated 1 October 1962. Mr. Chamberlain (the Pipe and Copper Shop Conference Chairman in 1957, noted previously) states that the purpose of this Memorandum addressing "Respiratory Protection for Pipecoverers" is:

> ***"To disseminate instructions concerning the safety requirements which are mandatory for all personnel working with asbestos insulating material."***

Mr. Chamberlain notes that asbestos dust counts were obtained during routine practices in the shop and onboard ships during the period of May to June, 1962. The results of these surveys prompted him to re-direct pipecoverer supervisors to again emphasize asbestos control procedures and ensure specified types of respiratory protection for dusts were assigned to pipecoverers onboard ship and that they were worn when asbestos-containing materials were being handled and a hazardous level of respirable dust was generated. He further directs that:

> ***"e. Care shall be exercised to control the formation of dust at all times. Old insulation material shall be placed in suitable containers as it is removed and not dropped or left lying on the ... [ILLEGIBLE] . . . shall be removed to a weather deck promptly.***
>
> ***f. Following insulation removal work, the deck shall be cleaned of all accumulated dust to prevent further contamination of the work area.***
>
> ***g. Where a large quantity of asbestos insulation is to be removed within a confined space, arrangements shall be made to assure that adequate exhaust ventilation is provided . . .***

4. Compliance with the safety requirements herein described is mandatory on the part of all personnel concerned."

Mr. Meeker, Mr. Chamberlain, and Mr. Storlazzi each realized that constant oversight and periodic reemphasizing of the asbestos handling and control requirements were essential when the potential for a hazardous level of respirable asbestos dust was present under shipyard working conditions. Finally, in 1969, the Navy determined that the only practical method of controlling exposure to hazardous levels of asbestos dust throughout the Navy was to make a concerted and directed effort to use substitute thermal insulation products manufactured either without asbestos, or using insulation materials with a lower content of asbestos and noted:

> ***"Since individual habits of workman play a large role in their exposure patterns, observations of their practices have been included in this survey. Most insulation workers are aware that exposure to asbestos dust, even in low concentrations, is hazardous but they also feel that the hazards are unavoidable and must be accepted as part of the occupation. Moreover, a recently published survey conducted by a naval shipyard aboard selected ships has revealed that, although dust respirators have been required during installation and ripout of asbestos, 76% of the workers did not use them. In fact 50% did not possess respirators even though they were readily available in central tool rooms.***

> ***This lack of worker discipline and the seriousness of the lung effects of asbestos could be the main deciding factors for considering the elimination of asbestos as a lagging material and as a cement on piping, ducts, and boilers and thus reduce and eradicate the reported incidence of asbestosis ranging from up to 21% among shipyard insulation workers."***

31. An early example of the many safety handbooks issued by the Navy as aids in safety indoctrination and accident prevention is the Bureau of Ordnance's "Safety Handbook for Pipefitters" issued on January 7, 1958. This handbook provides, in part:

> ***"<u>Asbestos.</u> Asbestos dust is injurious if inhaled. Wear an approved dust respirator for protection against this hazard."***

32. In 1959, the Navy, the Coast Guard, the Maritime Administration, and maritime industrial employers, as well as trade associations and labor organizations, were involved in the development of the standards which led to the "Safety and Health Regulations for Ship Repairing" (DoL, 1960). These Regulation were mandatory for all maritime repair and construction activities:

> ***". . . safety and health regulations that have been determined by the Secretary of Labor to be reasonably necessary to protect the life, health and safety of employees engaged in longshoring, ship repairing, and related employments covered by Section 41 of the Longshoremen's and Harbor Workers' Compensation Act, as amended.***

> . . .
>
> ***These regulations are mandatory with respect to employers subject to the Act, and affected persons should familiarize themselves with the contents of this publication. In this connection, Bureau personnel concerned with the administration of these regulations will extend all possible assistance."***

In these regulations, the Department of Labor (DoL) also adopted the occupational exposure level of 5 MPPCF for asbestos and required the use of respiratory protection at private longshoring, ship repairing, and related employments when indicated:

> ***"Protection against particulate contaminants not immediately dangerous to life. (1) When employees are exposed to unsafe concentrations of particulate contaminants, such as dusts and fumes, mists and fogs or combinations of liquids, they shall be protected by either and air line or filter respirators, except as otherwise provided in regulations of this part."***

For comparison to the degree of risk and hazard, the Department of Labor also used the occupational exposure level of 5 MPPCF as the same absolute value for high "free" crystalline silica dust (greater than 50% free silica). The silica value is also the same value established by the ACGIH in 1942 and promulgated in 1946. These nationally-enforced regulations, as well as the requirements of the Walsh-Healey Public Contracts Act, were applicable to private (non-government owned) shipyards.

33. The use of the 5 MPPCF level as the occupational exposure value continued to be generally accepted by professionals practicing occupational health in the United States. This occupational exposure value, and the widespread use of asbestos, continued in the Navy until the late 1960s when the scientific and medical communities (Selikoff 1965, 1967) and the United States Navy (Turnbull, 1969; OiC NAVSEC, Philly, 1969; COMNAVSEC, 1971; COMNAVSHIPSYSCOM, 1971; COMNAVSEC, 1972; COMNAVSEASYSCOM, 1975) had evidence that it was not sufficient to adequately control the health effects of exposure. This level was then changed, by the fledgling Occupational Safety and Health Administration (OSHA), to a time-weighted average of 12 fibers per cubic centimeter (12 f/cc) in May, 1971 and then to an Emergency Temporary Standard (ETS) of 5 f/cc in December, 1971. On June 7, 1972, the Federal asbestos regulations "Part 1910–OCCUPATIONAL SAFETY AND HEALTH STANDARDS: Standard for Exposure to Asbestos Dust" was published permanently reducing the permissible exposure limit of a time-weighted average to 5 f/cc. The new Federal standard also contained an extensive asbestos control program which was required of all <u>employers</u>. This "OSHA Asbestos Standard" which was quite similar to the Navy instruction released by the Navy the previous year (February, 1971): "NAVSHIPSINST 5100.26: Control of Asbestos Exposure Hazards" (DoN, 1971).

34. The Navy's sophistication regarding asbestos hazards in the 1960s was thus at the the cutting edge of then existing science and medicine. Captain NE

Rosenwinkel, MC, USN, representing the Navy's Surgeon General and the Bureau of Medicine and Surgery, provided information regarding the Navy's knowledge of asbestos hazards to shipyard employees for inclusion in a statement issued by Rear Admiral JJ Stilwell, USN, of the Shipyard Management Directorate, Naval Sea Systems Command in 1968 (Rosenwinkel, 1968):

> ***"The United States Navy is well aware of the hazards of asbestos to its employees engaged in ship construction and ship repair at naval shipyards. Hazard control measures implemented by the shipyard medical departments and safety divisions are in accordance with accepted standards of industrial hygiene practices in the United States. Stringent efforts are directed at keeping the concentration of airborne asbestos dust below the level recommended by the American Conference of Governmental Industrial Hygienists. An energetic periodic physical examination program insures the health of personnel exposed to this hazard."***

35. During the late 1960s, the state-of-the-art regarding the known health hazards of asbestos changed both inside and outside the Navy – as well as other US Government Departments and Agencies and private employers. Procedures to control asbestos exposures were made more stringent as the accepted – and now legally enforced – occupational exposure levels were reduced. Insulation manufacturers started including precautionary statements on their packaging in the early to mid-1960s. Asbestos exposure and

control were being addressed at different levels of command throughout the Navy. The Naval Ship Engineering Center was searching for substitutes for thermal insulation products which could meet the rigorous engineering requirements for shipboard applications: ***"Letter inquiries addressed to the Naval Shipyards resulted in 100% responses, whereas those addressed to private shipyards failed to elicit replies from Newport News Shipbuilding and Drydock Co. and Ingalls Shipbuilding Corp. However, General Dynamics, Lockheed Shipbuilding and Bath Iron Works responded to our inquiry."*** (COMNAVSEC, 1969). A meeting between senior engineering, safety, and medical personnel was held to evaluate possible methods for reducing exposure and to make recommendations to the Chief of Naval Operations. (Turnbull, 1969) Major Navy shipyards were sharing their research on asbestos exposure and control measures. (Mangold, 1970) Private contract shipyards were similarly controlling asbestos exposures and seeking suitable substitutes that were acceptable to the Navy and the Maritime Administration.

36. As mentioned, it was not until 1971 that statutory "permissible exposure limits (PELs)" became nationally established (and mandatory) under the Occupational Safety and Health Act (PL 91-596). These standards and their specific requirements applied to the employer, as the source of control of safety and health hazards in the workplace. Although these national standards applied to shipyards and other industries using asbestos, they did not directly apply to active duty Navy personnel and military unique settings. However, under a series of Executive Orders, the

Navy maintained an occupational health and safety program consistent with OSHA requirements. At the time of enactment in 1971, the PEL for asbestos was initially 12 fibers per cubic centimeter (f/cc). However, based upon the evolving and current scientific and medical recommendations by the time of enactment, the Occupational Safety and Health Administration (OSHA) emergently lowered the PEL to 5 (f/cc) (ceiling value of 10 f/cc) in late 1971, with a permanent standard of 2 (f/cc) becoming effective in 1976. The 1971 OSHA "Asbestos Standard" specifically addressed labeling of asbestos-containing materials based upon friability and the potential release of asbestos fibers into the air which would exceed the permissible exposure limit:

> ***"(2) Caution Labels.***
>
> ***(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that <u>no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos in excess of the exposure limits prescribed in paragraph (b) of this section will be released</u>."(OSHA, 1971)*** [EMPHASIS ADDED]

As discussed previously, based upon the permissible exposure limit criteria at the time that OSHA was enacted in 1970, non-friable asbestos-containing components used for electrical and fire retardant properties in insulation applications, as well as typical gasket and packing materials, did not require labeling due to their composition and friability. Even before this period, these types of materials were not considered to present any hazard during routine use and handling (Fuller, 1945). In 1975, OSHA recognized sufficient medical and scientific evidence of human carcinogenicity to recommend the reduction of the permissible exposure limit to 0.2 f/cc. After legal challenges, OSHA reduced the PEL to 0.2 f/cc in 1986, and further reduced it to its current value of 0.1 f/cc in 1994. Requirements from the highest levels of authority in the United States Navy established the permissible occupational exposure levels and control methods as they changed during this post- OSHA era. (DoN, 1971; BUMED, 1973; OPNAV, 1974) The Navy took further additional steps to eliminate the use of ***"asbestos in ship construction and maintenance, and to direct actions which will further reduce asbestos exposure"*** through its Asbestos Elimination/ Substitution Personnel Protection Program (COMNAVSEASYSCOM, 1975).

37. The Navy has continued to follow the policy of using occupational exposure levels based upon the best available scientific and medical information (BUMED, 1955). The federal PELs, established by the Occupational Safety and Health Act of 1970, were generally based upon the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs) published in 1968. Due to statutory requirements, changes to the limited number of chemical PELs have generally been slow. PELs have been changed for a relatively few chemicals since the enact-

ment of OSHA in 1970. The TLVs are periodically reviewed and an updated list is published annually. The TLVs more closely reflect the current state of knowledge and professional practice in occupational health. The Navy continues to use the most appropriate occupational exposure levels in the assessment of exposures and follows the requirements stated in the Chief of Naval Operations Instruction "OPNAVINST 5100.23F" (CNO, 2002) to provide workplaces that reflect the state–of–the–art knowledge and technology, consistent with its defined mission:

> ***"The maintenance of a safe and healthful workplace is a responsibility of commands throughout the Navy. A successful Navy Occupational Safety and Health (NAVOSH) program, one that truly reduces work-related risks and mishaps, results only when support and commitment to the program permeate every level of an organization. Within the Navy, the Chief of Naval Operations (CNO) has overall responsibility for the NAVOSH program and implements the program through the chain of command. Line management is responsible for the maintenance of safe and healthful working conditions."***

38. The Navy's modern safety program started in 1917 with safety engineers assigned to each naval shipyard. This initial program was expanded in 1922 with safety programs for civilian employees being introduced at all naval activities (NAVEDTRA, 1993). The Navy's Safety Program was driven from the highest level of authority and operational command – the Chief of Naval Operations (CNO). The "United States

Navy Safety Precautions," OPNAV 34P1, was signed out by the Acting Secretary of the Navy, CS Thomas, on 8 June 1953 (CNO, 1953). In his "charge" written in this instruction, Mr. Thomas states:

> ***"The safety of its personnel and the preservation of its materials have always been a major concern of the Navy Department. Evidence of this is the provision in Article 0406 of U.S. Navy Regulations, that "Each Naval Technical Assistant shall prepare and issue to the Naval Establishment the safety precautions, and instructions pertaining thereto, which are necessary or appropriate in connection with matters under his technical direction."***
>
> * * *
>
> ***"In recognition of the burden of responsibility which a commanding officer has for the personnel and material under his command, a governing article, 01104 Basic Rule of Responsibility, has been included to allow for adjustments to local conditions and unusual circumstances. The complete text of this article not only appears in Chapter 1, but is reprinted on the title page of each chapter of the book."***

The "Basic Rule of Responsibility" states:

> ***"Safety is a command function. Responsibility for the safety of personnel is vested in the commanding officer. Because these safety precautions apply only to usual conditions, commanding officers or others in authority may find it necessary to issue***

> ***special precautions to their commands to cover local conditions and unusual circumstances. In addition to the posting of appropriate precautions, careful instruction and indoctrination of all personnel are necessary to ensure effective compliance with these precautions."***

The Navy's comprehensive Safety Program was in existence before the Second World War and it continues to this day through the "Safety Precautions for Shore Activities" (initially OPNAV 31P1: United States Navy Safety Precautions (CNO, 1953); later NAVSO–2455 (OCMM, 1965): now NAVMAT P-5100 series (NAVMAT, 1970)) and "Safety Precautions for Forces Afloat": OPNAVINST 5100.19 series (CNO, 1973), and the "NAVOSH (Navy Occupational Safety and Health) Program Manual": OPNAVINST 5100.23 series (initially CNO, 1983). The "Naval Ships' Technical Manual (NSTM)" chapter on thermal insulation: "Chapter 9390: Thermal Insulation" was specifically revised to stress "Safety Precautions for Asbestos" in July 1972 and address the Navy's increased vigilance in controlling asbestos exposure onboard ship. The initial Navy-wide Safety Program combined both shore and shipboard environments (CNO, 1953):

> ***"2. Shipboard Safety. In most instances the hazards involved and the applicable precautions for a given type of work are the same whether the work is done afloat or ashore. <u>Precautions afloat are therefore not presented separately from precautions ashore except when they concern specific shipboard activities or conditions</u>."***
> [EMPHASIS ADDED]

. . .

"Delegation of Authority. <u>While the commanding officer cannot delegate the responsibility for the safety of personnel</u> under his jurisdiction, <u>he may delegate his authority</u> to the executive officer and other subordinates to ensure that all prescribed precautions are understood and strictly enforced." [EMPAHASIS ADDED]

. . .

"11312 Certification of Closed Compartments

1. Entry into Closed or Poorly Ventilated Spaces. <u>No person shall enter any closed compartment or poorly ventilated space in any naval unit including naval or Navy operated vessels unless and until a "gas-free" certificate has been issued</u> by the safety engineer or his authorized representative to certify that the danger of poisoning or suffocation of personnel, or the danger of ignition or explosion of flammable gases has been eliminated or reduced to the lowest practical minimum.

2. Entry in Emergencies. In case of emergency, when it is necessary to send a man into a compartment or tank not certified as being gas-free or as containing sufficient oxygen, the man shall be equipped with an air-line mask or an oxygen rescue breathing apparatus." [EMPHASIS ADDED]

. . .

" 11322 Definition of terms

1. Closed Compartments or Poorly Ventilated Spaces are any spaces that are not well ventilated, or which have been closed for any appreciable length of time. Unventilated storerooms, blisters, double bottoms, tanks, cofferdams, pontoons, voids, idle furnaces, cold boilers, etc., are typical." [EMPHASIS ADDED]

. . .

"Do not clean chips from the surface of machines with compressed air or with hands. A brush or hook should be used."

. . .

"The cleaning of one's clothes with compressed air is prohibited."

. . .

"Compressed Air. Compressed air shall never be blown towards anyone, used for cleaning of personal clothing, or used to cool a person off."

39. In order to coordinate sharing of occupational health information between organizationally distinct, and geographically distant, naval activities, the Bureau of Medicine and Surgery instituted the quarterly publishing of occupational health reports: "Occupational Health Hazards" during World War II. These reports were initially received by the Bureau of Medicine and Surgery from all field commands staffed with occupational health professionals, condensed, and redistributed to all the submitting commands (BUMED,

1955; 1959, 1961a, and 1961b). Later, the Navy Environmental Health Center continued this function until the late 1990s when electronic information sharing made the earlier process obsolete. These reports demonstrate that the sharing of industrial hygiene and other occupational health information and services between commands throughout the Navy was common since early in World War II.

40. Based on my education, training, and experience, it is my professional opinion that the Navy, the Maritime Commission, and other Federal Departments and Agencies were well aware of the health hazards associated with the use of asbestos from the early 1920s, consistent with the evolving state of knowledge at a given time. The Navy's extensive asbestos control program was the best in the Nation – controlling exposure to airborne asbestos fibers to a level below that known to be associated with either asbestosis or lung cancer – the only two asbestos-related pulmonary diseases known before 1960. Hueper, writing on occupational and environmental cancers in 1966, added mesothelioma to the cancers associated with clinical asbestosis, and notes the lack of long-term medical and pathological studies involving individuals exposed to asbestos dust. Although the control of asbestosis was accepted as also controlling the potential for further development of either lung cancer or mesothelioma, more data and analyses were needed at that time (Hueper, 1966).

> ***"Since the presence of asbestosis has usually been considered the prerequisite for the subsequent development of a carcinoma of the lung or of a mesothelioma of***

> ***the pleura or of the peritoneum, these deficiencies in the available information tend to impair a clear demonstration of the real scope of the existing associations between the two conditions. A second difficulty encountered in reliably assessing the extent and degree of lung cancer hazards of asbestotics is represented by the fact that there has occurred in the past a confusing duplication in reporting cases of asbestosis cancers."***

The Navy's and, similarly, the US Maritime Commission's decisions to use asbestos-containing materials were based upon operating requirements and missions in light of the known health hazards at the various periods of time. The Navy had a longstanding and notable occupational safety and health program that addressed asbestos and many other health hazards, and that provided exposure control recommendations and methods that were consistent with the state-of-the-art knowledge in science and medicine. The Navy operated under the premise that control of the exposure to asbestos fibers could essentially eliminate the hazard of a material considered essential for sustained Navy operations. Using established scientific and medical knowledge, the Navy developed an active program to control the release of asbestos fibers in dusty operations, as well as, to monitor the health of workers at risk. Indeed, the very first articles associating "by-stander" exposure with asbestos were not published until 1965, and the exposure situations were different from those in the US Navy (Newhouse and Thompson, 1965a; 1965b). The landmark study of Fleischer-Drinker, reported in 1945, confirmed the general thought that exposures in the Navy to asbestos containing materials could be controlled and health effects could be limited by medical surveillance. Navy industrial programs were directed at controlling what was considered significant releases of dust. During the period from about 1938 through the later 1960s, the widely accepted occupational exposure level was 5 MPPCF. In the mid-to-late 1960s, the Navy led the way in assessing asbestos exposure of personnel and developing a program and process to eliminate the material based upon new scientific and medical information that was becoming available.

41. To the extent that the equipment and product manufacturers with which I am familiar ever delivered equipment to the US Government for use on vessels constructed for the US Navy and the Maritime Commission/Administration, the US Government had already recognized that the prolonged inhalation of sufficient concentration of respirable asbestos fibers could result in pulmonary disease. Indeed, this knowledge was held by the US Government prior to the period of construction of ships in the 1940s (Dublin, 1922; Jenkins, 1939; Bureau of Medicine and Surgery, 1939). Based upon that scientific and medical knowledge, the US Government, generally, and the US Navy, specifically, by the early-to-mid 1940s had already developed an active and robust program to control exposure to airborne asbestos fiber concentrations at levels recognized to be harmful, and medically monitored personnel exposed to those levels. Additionally, the Navy established engineering control procedures (including isolation, exhaust ventilation, wet methods, and process changes to minimize dust

release) and training, and required the use of respiratory protection for personnel considered to be at risk of excessive exposure during dusty operations (Dublin, 1922; Brown, 1941; Forrestal, 1941; Knox, 1941). These dusty operations primarily arose from the handling and use of the friable asbestos used in thermal insulation applications. Control of exposure to asbestos fibers based upon the concentration and duration – sufficient to prevent asbestosis – was considered by medical authorities, both international and domestic, to concomitantly control the (then believed) causal relationship between asbestosis and pulmonary cancers. (Smith, 1952; Doll, 1955; Hueper, 1966) Indeed, the levels discussed in the landmark studies by Merewether and Price (1930a, 1930b, 1933a, 1933b, 1934) to prevent the development of asbestosis were actually far above the occupational exposure level of 5 MPPCF used by the US Navy. Thus, by controlling the exposure of personnel to asbestos fibers and preventing the development of asbestosis, the Navy, based upon the consensus of the scientific and medical communities of the day, *de facto* controlled the potential for the development of respiratory cancers. It is further worth noting that, at this time period, the Navy and other US Government Departments and Agencies, and the scientific and medical communities in general, were **not** seeking to control the smoking of tobacco products as the significant cause of the rising lung cancer rate.

42. Under the accepted occupational exposure "guideline levels" of the time period before the enactment of OSHA (there were no national, statutory occupational exposure levels (OELs)), there was absolutely no hazard created by the handling and use of

asbestos in gasket and packing applications in naval steam systems – or likewise – in non-friable, asbestos-containing electrical insulating components. The potential release of respirable asbestos fibers was, and still is, minimal from these sources (Liukonen et al, 1978), as well as in cable, wire, and other electrical applications – such as bound phenolic resins and "fish paper" insulation – based upon my own personal knowledge and professional experience, as well as the many studies cited by Mowat et al., 2005, and Williams and coworkers, 2007. Many Navy and other published studies have confirmed that the greatest potential for exposure to airborne asbestos fibers onboard ship comes from the uncontrolled application and removal of thermal insulation, not the handling of gaskets and packings, or wire, cable, and other electrical components. (Robbins and Marr, 1962; Marr, 1964; Harries, 1971; Liukonen et al, 1978; Mowat et al., 2005; Williams et al, 2007; Hollins et al, 2009) Attention to even the potential for release of asbestos fibers from non-thermal insulation materials only arose as the permissible exposure limit (PEL) for asbestos decreased dramatically following the enactment of the Occupational Safety and Health Act in 1970, and the environmental controls of the "US Environmental Protection Agency National Emission Standard for Asbestos" (US Congress, 1971) and the Toxic Substances Control Act (TOSCA) (USEPA, 1976) regulated asbestos as a controlled environmental pollutant. Prior to that period in the early to mid-1970s, the Navy and contract shipyards (and other federal and state entities) were using 5 million particles per cubic foot (5 MPPCF) as the occupational exposure level for asbestos; environmental releases into air, water, and land were not regulated. It was not until the accepted occupational exposure levels of the post-OSHA period decreased that the possible release and exposure to asbestos fibers from the handling of gaskets and packings at concentrations approaching the new OEL became a concern. Prior to the 1990s, the Navy study by Liukonen and coworkers (1978) at the Puget Sound Naval Shipyard (PSNSY) stands out as one of the few, and best known, evaluations of such materials. This study demonstrated that gaskets did not present an asbestos hazard under normal conditions to individuals who were directly working with such materials.

43. Similarly, Captain JC McArthur, USN, addressing a Congressional subcommittee on behalf of the Navy, noted in 1978 (McArthur, 1978):

> ***"In addition to thermal insulation, other shipboard asbestos applications include those products which can be found in general use by industry and in homes and office buildings. Floor tiles, various gaskets and valve stem packings and galley range insulation are just a few examples. However, this asbestos is in a bonded or contained form and routine careful handling would preclude emissions of potentially hazardous levels of airborne fibers."***

Again, at the time that this official statement was made by CAPT McArthur in 1978, the permissible exposure limit (PEL) of 2 fibers per cubic centimeter had been established under the Occupational Safety and Health Act of 1970 (US Congress, 1970). This level was also used by the United States Navy at that time. This level of 2 f/cc was significantly lower than the OEL used by the US Navy during the period from the

1940s through the late 1960s – 5 million particles per cubic foot (5 MPPCF; approximately 30 f/cc).

44. An earlier study performed at the same Puget Sound Naval Shipyard (Mangold et al, 1970) evaluated asbestos controls and the prevalence of clinical findings associated with uncontrolled exposure to airborne asbestos fibers. It must be emphasized that Mangold's study was conducted among a population of shipyard workers who had their total period of employment before the strictly-mandated exposure controls and permissible exposure limits were established under the Occupational Safety and Health Act of 1970. Furthermore, personnel listed under the various trades were included in the study based upon their current working position – not their past occupational history; this is an important confounder. These federal employees ("civil servants") were shipyard craftsmen who worked daily in specific trades building, repairing, overhauling, and modernizing Navy ships – their tasks and duties were not equivalent to those of the Sailors who primarily operated and maintained that shipboard equipment at sea-but rather, their shipyard duties represented the extreme in an exposure analysis. Mangold's study identified 22 of 104 pipecoverers (21.2%) with "positive chest x–rays" which were suggestive of prolonged asbestos exposure, whereas only 6 of 765 pipefitters (0.8%) had such findings. The former group was responsible for insulating pipes and equipment on a daily basis; the latter group was comprised of individuals who routinely worked with bare, uninsulated metal piping and equipment. In contrast, shipboard repair of thermal insulation by Navy Machinist's Mates was normally restricted to

minor patching under usual operating circumstances (Bureau of Naval Personnel, 1958):

> ***"MAINTENANCE AND REPAIR VALVES AND PIPING:***
>
> ***Aboard ship you are responsible for the routine maintenance of valves, and piping assemblies in your assigned spaces. In addition, the qualifications for advancement in rating require that you know how to make minor repairs to insulation or lagging in piping; how to reface valve seats and disks; and how to repack high-pressure valves. Unless the piping system and valves are in good condition, the connected units of equipment and machinery cannot be operated efficiently, and the safety of the ship's personnel may be imperiled."***

This restriction was due to the scope of what could be repaired at sea, the limited availability of parts and insulating materials, and/or the need for heavy equipment or specialized tools to perform major repairs. Additionally, the Navy developed "portable" or "removable" pads, or "insulation blankets", for use on access portals or surfaces/areas when frequent access was required. This reduced exposures to asbestos dust which resulted from removing and replacing hard covering (block/pipecovering and cement (mud)).

Navy Boilermen (BTs) were also expected to perform similar minor repairs on such piping as part of their routine duties. (BuPERS, 1956)

> ***"As a Boilerman, you will be required to install or patch insulation and lagging on***

steam lines and on other fireroom piping. It is important for you to know what materials are suitable for the various services and to know how to apply these materials.

In general, the materials used to insulate piping include the insulating material proper the lagging or covering and the fastenings which are used to hold the insulation and lagging in place. In some instances the insulation is covered by material which serves both as lagging and as fastening."

. . .

"Insulating materials must always be selected with regard to the temperatures to which they will be exposed. In addition to the actual insulating characteristics of the material such characteristics as structural strength, resistance to shock and vibration, chemical stability, fire-resistance, and ease of application and repair must be considered. Insulating materials commonly used on high-temperature piping include magnesia-asbestos composition, mineral or rock wool, asbestos, fibrous glass and several types of insulating cements."

. . .

"Asbestos is used for many insulating purposes and is provided in various forms Asbestos cloth is used as lagging over insulating material on valves fittings flanges and pipes. Asbestos felt is used for both

> ***low–temperature and high temperature insulation. Flameproof asbestos in the form of soft flexible sheet is used for lagging and insulation where space does not permit thicker or more rigid forms of insulation."***

While performing such minor and occasional tasks involving external thermal insulation, the exposure of Sailors – either Machinist's Mates or Boilermen – to airborne asbestos fibers was not considered to be excessive. Again, under shipyard or "tender" conditions where there could be a substantial amount of such work being performed, strict dust controls were mandated. However, when considering the actual time and duration of these limited and infrequently-performed tasks while underway at sea, or in port by the ship's crew, the total exposure (dose = concentration x time) to airborne asbestos fibers was not considered by Navy occupational health professionals to be excessive or hazardous. (BuMED, 1961a) When possible, control of fiber release during the dustiest task of removal would be aided through the application of water – however, in some emergent conditions when hot steam system components required immediate attention, the use of such wet methods could be catastrophic.

In Mangold's study of personnel who had been working under the historically less restrictive occupational exposure guidelines of 5 MPPCF that were followed during the decades preceding his study reported in 1970, marine machinists and machinists had "positive chest x-rays" in 0 of 490 (0%) and 1 of 536 (0.2%), respectively. These two groups comprise the trades that would most commonly work directly with equipment located in shipboard machinery spaces – such as valves, pumps, and turbines. The "boilermakers" in this study (tradesmen actually constructing, making major repairs, and re-building boilers – not operating and maintaining them like Navy Boilermen – had "positive chest x-rays" in 4 of 115 (3.5%). At this point in time, the association of a shipyard "Boilermaker's" tasks with only occasional work with asbestos-containing materials and the excessive risk of developing an asbestos-related disease were just beginning to be appreciated (Mangold et al., 1968, Mangold 1969c, Selikoff, et al., 1979). There were 574 individuals included in the category of "electrician"; there were no individuals with "positive" chest x-ray findings in this large group. As a control or comparison group in this study, 1 of 420 clerical workers (0.2%) had a "positive chest x-ray". The "marine machinists" (also called "outside machinists") performing tasks like removing and replacing shipboard machinery, had "positive chest x-rays" in 1 of 536 (0.2%) – similar to that of the control group of clerical workers. For comparison with active duty US Navy personnel, the "corresponding" shipyard job categories and day-to-day responsibilities of shipyard workers differed significantly from these Sailors with respect to intensity, duration, and frequency of potential airborne asbestos exposure. Navy Machinist's Mates (MMs), Boilermen/Boiler Tenders/Boiler Technicians (BTs), and Enginemen (ENs) primarily operated the machinery, and performed limited maintenance and repairs when necessary in order to keep the ship operating. Major repair operations were restricted to yard periods, or, when necessary, periods of availability with a Navy tender using skilled personnel and specialized tools and equipment. The differences in the type of work and exposure to asbestos fibers between shipyard workers and operators are discussed and accounted for by Williams and co-workers (2007). Table I is derived from Mangold and co-workers, 1970):

TABLE I: INCIDENCE OF POSITIVE CHEST X–RAY FINDINGS IN OCCUPATIONAL GROUPS

14) Occupational Group	15) No. of Persons In Group	16) No. With Pos. X-Ray Findings	17) Percent Having Pos. X-Ray Findings
18) Shipfitters	19) 890	20) 6	21) 0.7
22) Sheetmetal Workers	23) 489	24) 6	25) 1.2
26) Forge Workers	27) 32	28) 0	29) 0.0
30) Welders	31) 998	32) 11	33) 1.1
34) Machinists	35) 536	36) 1	37) 0.2
38) Marine Machinists	39) 490	40) 0	41) 0.0
42) Boilermakers	43) 115	44) 4	45) 3.5
46) Electricians	47) 574	48) 0	49) 0.0
50) Pipe Coverers & Insulators	51) 104	52) 22	53) 21.2
54) Pipefitters	55) 765	56) 6	57) 0.8

58) Shipwrights & Joiners	59) 228	60) 0	61) 0.0
62) Electronics Mechanics	63) 280	64) 0	65) 0.0
66) Painters	67) 263	68) 4	69) 1.5
70) Riggers	71) 664	72) 1	73) 0.1
74) Temp Service Mechanics	75) 143	76) 1	77) 0.7
78) Clerical workers	79) 420	80) 1	81) 0.2

Due to the potential for shipyard insulation workers to experience frequent, intense, and prolonged periods of direct work with asbestos-containing materials in the shipyard setting, the emphasis of the Navy's program, as well as the programs established under US statutes, such as the Walsh-Healey Act (1936) and the "Safety and Health Regulations for Ship Repairing" (1960), were principally directed at shipyard exposures to airborne asbestos fibers for both the employed civilian personnel in their daily tasks – as well as active duty Sailors during shipyard periods as discussed by Wynkoop (1947) and Franklin (1964). The multiple "components" of the Navy asbestos control program, as well as the program required under the "Safety and Health Regulations for Ship Repairing" (DoL, 1960) existed to control and minimize untoward exposure to airborne asbestos fibers from thermal insulation materials. Control of exposure was effected through the adoption of an occupational exposure level (OEL) based upon the best available scientific and medical information at the time; establishment of the methodology to evaluate exposures; use of industrial hygiene control measures (local exhaust ventilation; wet methods); use of personal protective equipment including respiratory protection, product substitution; periodic medical evaluations; recordkeeping; and local training and awareness programs – all required, as necessary, based upon the potential for the release of asbestos fibers from friable materials.

45. The review by Dr. PRD Williams and co-workers (2007), as well as the large studies of US Navy shipyard workers conducted by Mangold and co-workers (1970) and British dockyards by Harries (1968; 1971), discuss the traditional tasks and practices which resulted in airborne asbestos fiber exposures of electricians – a trade that was not considered to be at risk from working with asbestos–containing materials during the pre-OSHA period. The airborne asbestos fiber concentrations were less than the recommended exposure guidance level (pre-OSHA) or statutory occupational exposure limit (post-OSHA) during the various time periods until 1976, when the OSHA Asbestos PEL became 2.0 f/cc. Prior to 1976, airborne asbestos concentrations to electricians were not generally thought to result in clinically significant exposures. As the OSHA Permissible Exposure Limit (PEL) was lowered after 1970, the responsibilities of the employer were defined while the widespread dissemination of information concomitantly occurred. The April, 1971 issue of "The Electrical Workers' Journal" contains an article on the newly promulgated "Occupational Safety and Health Act" and states that:

> ***"AFL-CIO President George Meany termed the Occupational Safety and Health Act "a long step down the road toward a safe and healthful work place," but he stressed that***

> ***"achievement of that goal will not be automatic." He warned that labor will keep a watchful eye on the enforcement machinery, stressing that, it it doesn't work effectively, "we will immediately petition Congress to strengthen and improve it."*** (Pillard, 1971)

Mr. V Cohn's 1972 Washington Post article reflects the knowledge of the nation's largest federation of unions – it is titled: "AFL-CIO Warns on Asbestos Cancers". The International Brotherhood of Electrical Workers (IBEW) was an affiliate of the AFL-CIO. The June, 1973 issue of "The Electrical Workers' Journal" contains an article detailing "The Target Health Hazards" under OSHA – which lists "Asbestos" prominently as the first of the five nationally-targeted health hazards. This article even lists the applications of asbestos under:

> ***"Where is it? The heat-resistant properties of asbestos have led to many uses – for example, protection against fire, insulation, brake and clutch linings, building materials, filter materials, and in plastics. The raw material and end-products are found nearly everywhere."***

This article also lists the hazard and health consequences of asbestos exposure. The June, 1978 issue of "The Electrical Workers' Journal" contains another article dealing with Asbestos Related Diseases. Dr. Irving Selikoff, writing in "The Asbestos Worker" (for the Association of Heat and Frost Insulators and Asbestos Workers – another affiliate of the AFL-CIO) discusses "New Mask Undergoes Field Test" in the May, 1969 issue and his efforts to find an air-filtering respirator which is both suitable, as well as acceptable, to insulation workers.

46. The information possessed by the US Navy, the Maritime Administration, and other Federal Departments and Agencies with respect to the specification and use of asbestos, and the health hazards associated with its use onboard US vessels, far exceeded any information that possibly could have been provided by an equipment manufacturer. An equipment or product manufacturer had absolutely no authority, responsibility, or control over the US Navy or private workplace, or the respective personnel – all essential aspects in hazard communication and control. The Navy had long recognized and accepted the responsibility of command, or the "employer's role" as the controller of the workplace, in the practice of occupational safety and health. This was also recognized under the Occupational Safety and Health Act; the Act was put into effect through the employer – with the adherence of the employee. It must be noted that the asbestos-related and other standards of the Occupational Safety and Health Act of 1970 were mandatory for all private employers including shipyards; OSHA did not include Executive Branch Federal workers nor the military. However, under Section 6 of this Act, Federal Departments and Agencies were directed to establish and maintain comprehensive and effective occupational safety and health programs consistent with the standards of the Act. Additionally, Presidential directives (Executive Orders) were issued in 1971 (EO 11612), 1974 (EO 11807), and 1980 (EO 19126) requiring each Federal Department or Agency to comply with the OSHA standards. A series of wide-reach-

ing Navy directives, referenced above, were promulgated to meet these requirements. It is obvious that, based upon the knowledge at any given point in time, the Navy and the Maritime Administration were fully aware of the health hazards of asbestos and had programs dating back before World War II to control exposure of personnel and monitor their health; and that this knowledge persists through the present day. The knowledge of the hazards created by the use of asbestos containing materials was weighed with respect to the vital benefits provided by its use. The Navy controlled asbestos exposure consistent with the then current state of accepted scientific and medical knowledge balanced by needs for national defense. The Navy's asbestos control program, at all times discussed above, was multifaceted and complex, and included hazardous process identification, engineering controls, use of alternative materials in accordance with Navy specifications and contract requirements, personal protective equipment, training and education, and medical surveillance – all when indicated by the level of exposure to airborne asbestos fibers. A mere warning statement, possibly confusing and always superfluous – and perhaps even incorrect and in direct opposition to established Navy policy and procedures – would have added nothing to the Navy's existing occupational health program for the control of asbestos exposure to the hazardous concentrations universally accepted at various points in time from the 1920s until the present time. However, in the mid-1960s, primary asbestos manufacturers of thermal insulation materials began placing a warning on their friable thermal insulation products (Johns-Manville, 1964); this label contained information similar to that later required for such friable products under the Occupational Safety and Health Act asbestos standard (DoL, 1972). Additionally, it must be remembered that the Navy's occupational health program existed through periods of war and military conflicts and was an additional consideration in the decision-making process at all levels of the Navy command structure.

47. Concomitant with the dissemination of information within the Navy and the Federal Government, as alluded to briefly above, labor unions also were involved with advocating and ensuring compliance with the new Federal standards (Cohn, 1972). Dr. IJ Selikoff, a physician deeply interested in the identification of risks and exposures among a much more intensely-exposed group – namely the insulation workers in the United States, worked closely with the AFL-CIO's affiliate, the Association of Heat and Frost Insulators and Asbestos Workers, during the 1960s and 1970s to assess asbestos exposures, confounding factors, and the development of disease. In 1965, Dr. Selikoff writing with Churg and Hammond noted.

> ***"Scattered case reports have previously been recorded of neoplasms among insulation workers, including both lung cancer and mesothelioma of both the pleura and peritoneum. A lung cancer has also been reported in a workman in a factory making asbestos Insulation. However, these reports, while interesting and valuable, could not establish an association between the two conditions."***

In that same year, Hammond (1965) commented on the level of inhalation asbestos exposure of full-time insulation workers who experienced daily exposures to levels of airborne asbestos fibers also far greater than those of sailors "steaming ships" and performing occasional work on steam systems with external, asbestos-contain insulation:

> ***"I believe that there was hardly anybody a few years ago who would have suspected that there was a lung cancer risk in this group of insulation workers. These men were not asbestos weavers nor asbestos miners, and nobody at that time had suggested an increased risk at all for insulation workers."***

Dr. Selikoff further noted that the association between general shipyard work performing non–routine work with insulation, and the potential for the development of asbestos–related lung disease was not recognized before 1968:

> ***"In 1968, the possibility that asbestos-associated disease might be an important problem of shipyard workers was suggested." (Selikoff, et al., 1979)***

In his address to the delegates of the Twenty–first Convention of the Association of Heat and Frost Insulators and Asbestos Workers in 1967, Dr. Selikoff noted that cigarette smoking was a major factor in the development of lung cancer. At this time, Dr. Selikoff also noted that mesothelioma was a very rare disease which may also be related to some types of asbestos exposure among insulators.

> ***"Also, by the way, I did not see a cancer of the lung in an asbestos worker who smoked cigars or an asbestos worker who***

> ***smoked pipes, if he didn't smoke cigrettes at the same time. If levity were in order at this time, I perhaps should say, "Put that in your pipe and smoke it" (Laughter.)"***
>
> **. . .**
>
> ***"And something else: There is a very rare disease-and you can break your teeth on this one-called mesothelioma. Nobody knows too much about it I will tell you why nobody knows about it Because it has been so rare that it is not even coded by the U.S. Bureau of Statistics. It is not separately coded in the International Classification of Causes of Death. It is very rare, so rare that at my hospital, from 1930 to 1960, we only saw three cases, and we have a huge hospital, very active."***

In 1965, Newhouse and Thompson (1965a, 1965b) reported cases of asbestos-related disease in individuals who were identified as not having worked directly with asbestos-containing materials. These "bystander" exposures were scientifically untested and unique with respect to the type of asbestos (crocidolite or amosite) – and this conclusion was not universally held by major asbestos researchers (Hueper, 1966). Selikoff, in responding during the "*Symposium on Asbestosis*", published as "Pneumoconiosis: Proceedings of the International Conference, Johannesburg, 1969", stated that he had contacted Dr. Newhouse to advise her that he had reservations regarding the current scientific ability at this time to justify giving an estimate of the risk associated with indirect "environmental exposure" of bystanders or family member and stated:

> ***"It may be very much overrated. All we can say at this time is that there is a significant occupational risk. We have yet no cohort studies on how many people have been exposed in neighbourhood areas or in family exposures. It probably is very much less than we think.***
>
> ***... Therefore, unless we can identify true absence of occupational exposure, we have to regard labels of pure family or neighbourhood exposure with caution.***
>
> ***I think that this is very important. All of us are faced with a very practical problem. What exactly is the exposure with which asbestos disease is associated? We must define this. At the present time, our definition is only that, in specific industrial circumstances, a significant risk occurs. This, I think, can be controlled if we put our minds it On the other hand, much more data are necessary before we can label the magnitude of non-occupational exposures with any degree of accuracy."*** (Selikoff, 1970)

In sum, the scientific and medical data of the period extending through the mid-1960s had not even identified a risk of cancer – specifically mesothelioma – in individuals who were occasionally handling and working with asbestos-containing materials, or those having exposures to inhalable asbestos at low or intermittent levels compared to the widely-accepted occupational exposure level of 5 MPPCF. This conclusion is fully supported by the leading asbestos-disease investigators of the era – for example Irving J. Selikoff, MD, writing reflectively with DH Lee, MD in 1979:

> ***"The decade of the 1960s provides a convenient time at which to terminate a historical view of asbestos disease. With admirable hindsight from the late 1970s we can see that the essential evidence had already been reported, but not yet assembled or vested with sufficient credibility to be entirely convincing. With few exceptions, the evidence at that time rested on scattered reports of small numbers of cases, and the cases themselves suffered from being either selected or simply those that happened to come to the attention of the reporter. The population base from which the cases came was seldom mentioned. The significance of pleural changes and the occurrence of mesothelioma in persons without a distinct history of exposure remained in considerable doubt. The idea that asbestos could be at least a cofactor in the production of bronchogenic carcinoma was far from fully accepted. That parenchymal asbestosis was very likely to occur in those who had been exposed to heavy dosage in the early years of the industry was clear enough, but what effect environmental controls that had been introduced in the late 1930s might have upon its future prevalence was unknown. The possibility that quite low dosages might have grave consequences 30 or more***

years after first exposure was still unproven.

Many things were needed to confirm the suggestions that were emerging from the studies up to that time. Most importantly, systematic epidemiologic investigation was needed of large cohorts drawn from various types of industry, with the inclusion of adequate control populations. Some of these were already organized, but it was too early for the results to be meaningful. We now know that much of the negative evidence stemmed from coming to conclusions prematurely, before the slow processes of carcinogenesis had had a chance to make themselves evident. We now know also that reduction of heavy exposures that lead to early death would reveal such slowly developing diseases as mesothelioma and bronchogenic carcinoma with increasing clarity. But foreknowledge was not available at the time, although some investigators suspected that the auguries were not good. More sophisticated and sensitive ways of recognizing the disease processes at an early stage, before the appearance of marked radiographic changes, were badly needed. A series of international conferences, some already in the planning stages, were to accelerate these developments greatly. Those who felt that it was an exciting time

> ***were not to be disappointed. The excitement has not even yet been entirely dissipated."***

This conclusion is also supported by the earlier articles which were published by Dr. Selikoff in the mid-1960s (Selikoff, Churg, Hammond, 1964; Selikoff, Churg, Hammond, 1965; and Selikoff, 1967.)

WHAT COULD AN EQUIPMENT MANUFACTURER HAVE TOLD THE US NAVY, OR ANY INDUSTRIAL OR COMMERCIAL CUSTOMER?

48. When addressing what asbestos-related information an equipment or product manufacturer or vendor could have provided to the US Navy, the Maritime Administration, or a Department or Agency of the Federal Government, or to any industrial or commercial customer, that it did not already have and consider in its specification and use of asbestos-containing materials, one must realize what was known about the health hazards of asbestos and when it was known.

49. The United States Government's and the US Navy's knowledge regarding the applications of asbestos and the health effects represented the state of the art. During the period from the early 1920s to the late 1960s, there was nothing about the hazards associated with the use of asbestos containing products used on or in equipment on United States Navy ships known by an equipment manufacturer that was not known by the United States Government and the United States Navy. The expected, routine use and handling of asbestos–containing materials during

normal shipboard operations simply presented no significant hazard that was understood by science and medicine of the time period – much less a "special hazard". "Toxicity" is a property inherent in all chemicals as a consequence of its concentration. In the practice and application of toxicology, it is well known that ALL chemicals are toxic as a consequence of dose (Paraselsus [1493–1541]: "*Sola dosis tacit venenum*"—"Dose alone makes the poison") and that "hazard" is a consequence of how a chemical is used. All chemicals under certain conditions can cause harm to a living organism. So, all chemicals may present a hazard under certain conditions. The "conditions of use" and "exposure", and the realization that harm can result define a "hazard" – and the need to control it. A "special hazard" would then be one that is extraordinary, or extremely severe or not expected. Exposure to airborne asbestos fibers of a sufficient concentration for a sufficient period of time could cause fibrosis and damage the lung (asbestosis). The Navy's knowledge and "occupational health program" to control excessive exposure to asbestos predates even the scientific or medical proof that asbestos could cause lung fibrosis by Cooke in 1924, and the use of the term "asbestosis" by Sir Thomas Oliver in 1925. In 1922, the potential for this inorganic dust to cause harm was recognized by Dublin in his "Notes on Preventive Medicine for Medical Officers, United States Navy" and Navy physicians were given a precautionary notice. In this document, Dr. Dublin addresses asbestos exposure as one of the "Occupational Hazards and Diagnostic Signs: A Guide to Impairments to be Looked for in Hazardous Occupations."

50. By the 1950s, control of exposure to airborne asbestos fibers based upon the concentration and duration – sufficient to prevent asbestosis – was considered by medical authorities, both international and domestic, to concomitantly control the (then believed) causal relationship between asbestosis and pulmonary cancers. (Smith, 1952; Doll, 1955; Hueper, 1966) The association of one type of amphibole asbestos with the development of a rare and uncommon type of cancer, mesothelioma, was not demonstrated until several years later with the work of Wagner and his coworkers in 1960. (Wagner et al, 1960) Wagner and coworkers established the association of mesothelioma with a specific type of asbestos, crocidolite, under conditions which were totally different than those found in naval applications or onboard ship – and to a chemically different form of asbestos. The proven association of amosite (the type of asbestos used extensively for thermal insulation on Navy combatant vessels of this period) and mesothelioma was not established until the work of Selikoff and his associates in 1972 (Selikoff et al, 1972). Throughout the period from 1950 until the mid-60s, limiting exposure to airborne asbestos fibers to levels below those which would cause asbestosis, would concomitantly control the development of cancer – either lung cancer or malignant mesothelioma. Federal programs were based upon this sound, and widely held concept.

51. With the increasing use of asbestos in World War II, the Navy expanded its occupational health programs for asbestos and other chemical, physical, and biologic agents which were consistent with the state-of-the-art for each of these potential hazards at that time; these wartime programs were discussed by

Captain Brown in 1941. Philip Drinker, writing as the United States Maritime Commission's Chief Health Consultant to the Navy's Bureau of Ships in 1945, recommended that 5 MPPCF be used as the industrial hygiene control level – even before that level was formally recommended by the American Conference of Governmental Industrial Hygienists in 1946. This is the same value that was used as the occupational exposure level in the noteworthy "Fleischer-Drinker study" published in 1946. This study measured total dust, and asbestos dust, in four US Navy shipyards and onboard ships during various operations, and also evaluated medically-associated outcomes.

52. In one of his early roles as a consultant to the US Maritime Commission and working before the "Minimum Requirements" were enacted in early 1943, Philip Drinker, then at Harvard School of Public Health, led five US Navy officers in the performance of a general Industrial Health Survey of the Bath Iron Works in September, 1942. (Drinker, 1942) This survey reviewed the industrial shore facilities and ships under construction. The ventilation in the Pipe Covering Shop was qualitatively assessed and recommendations were offered:

> ***"The conditions in this shop present a very real asbestosis hazard and immediate steps should be taken to segregate the most dusty processes into a well ventilated area. Local exhaust ventilation of proper design should be installed; however, if conditions can not be completely controlled in this manner, then suitable dust respirators should be worn by the workers. Periodic***

> ***physical examinations of the chests of all workers should be made. Every six months is a reasonable interval."***

During this survey in 1942, Drinker and his team noted that a variety of respirators were available for issue, at no cost, in the Tool Room. It was further noted that a program for the repair, cleaning, and sterilization for these respiratory protective devices was in place.

53. In December, 1944, WC Dreessen (a "Surgeon-grade officer" with the US Public Health Service and lead author in the earlier US Surgeon General's Report: Public Health Bulletin No. 241) and Lieutenant Commander WE Fleischer, USNR (a Navy physician assigned to the US Maritime Commission's East Coast Regional Construction Office and lead author in the later "Fleischer-Drinker Report"), formally investigated Bath Iron Works (BIW) regarding "Asbestosis from Amosite Pipe Covering at Bath Iron Works". The BIW shipyard was now performing work under the statutory "Minimum Requirements for Safety and Industrial Health at Contract Shipyards" (1942). As the Chief Health Consultant of the US Maritime Commission, Drinker directed this investigation as his office had ***"heard that there was concern among the pipe covering crews who feared that the amosite was causing some respiratory troubles."*** In the report of their findings, these US Government representatives provided the following:

> ***"1. Provide adequate ventilation at all points where dust is created when handling Asbestos Products and Diatomaceous Earth Products capable of producing Silicate dust.***

> ***2. Require all employees to wear suitable approved respirator when engaged in any work where there could be exposure to Asbestos Dust.***
>
> ***3. Provide pre-employment medical examination of the chest area for those who are employed In work where there is exposure to Asbestos Dust. (The purpose of the pre-employment examination is to eliminate prospective workers who have respiratory ailments or who are susceptible to respiratory ailments.***
>
> ***4. Provide periodic medical and chest examinations for all employees engaged in work where there is an exposure to Asbestos Dust. It is suggested that such periodic medical and X-ray examinations be made at intervals of at least every six months."*** (Dreessen and Fleischer, 1944)

In follow-up reports of total and asbestos dust counts at BIW, the US Maritime Commission industrial hygienist performing the microscopic analysis discussed his findings (Thompson; 1945):

> ***"In all counts except those taken in cutting asbestos, there appeared to be a great deal of material about 1 micron in diameter and of a very uniform size. This did not appear to be in the least fibrous, and I suspect it may be particles of cement which are used in the mixture. Certain of the basic materials used contain large quantities of diatomite."***

Dr. CR Williams (1945) performed petrographic analyses of these dust samples at his Harvard School of Public Health laboratory. His results confirm that general area dust onboard ships has variable concentrations of total and respirable asbestos – with the vast majority of dust in non-amosite cutting operations comprised of materials other than asbestos.

54. The Navy's occupational health program not only addressed asbestos exposure, but it had a significant medical component which contributed to advancing the state-of-the-art knowledge. In 1955, Mr. JR Sheehan, an industrial hygienist at the Long Beach Naval Shipyard, wrote to Mr. Webster Ay, the Secretary of the Asbestos Union #20 at that Yard (and one of the individuals involved in the production of the "Grim Reaper" Poster used nationally for asbestos hazard recognition and control since the 1950s), to inform him of the availability of a new medical test being developed by Hurley Motley, MD (at the University of Southern California) to measure early pulmonary function changes and encouraged its acceptance and use among the Yard's asbestos workers, pipe coverers, and insulators. This type of test later became commonly used as it was more sensitive than chest radiography in detecting early lung changes from dust exposure. In addition to industrial hygiene engineering controls, the Navy also developed task specific training for individuals potentially exposed to levels of asbestos exceeding 5 MPPCF.

55. By the 1960s, the then-recognized hazards of asbestos were becoming known within the relevant industries – that is to say, the manufacturers and major users of asbestos thermal insulation. The best scien-

tists of the era were beginning to recognize the association between chronic asbestos exposure among insulation workers and the newly-recognized disease mesothelioma (Selikoff, Churg, Hammond, 1965). At the same time, the major thermal insulation manufacturers began placing asbestos safety caution labels on the packaging of their insulation products – Johns Manville in 1964 and Owens-Corning Fiberglas in 1967. The national insulators' union, and industry, began a major nationwide push to educate thermal insulation workers about the hazards of asbestos. (Selikoff, 1967) Still, the federal government, virtually every state in the Nation, and the world's entire scientific and medical communities universally followed 5 MPPCF as an acceptable continuous, daily occupational exposure level for asbestos. This was a level of exposure associated with asbestos textile manufacturing, career insulation workers, and virtually no one else. Individuals operating equipment with asbestos-containing thermal insulation, or those working with or handling non-friable, asbestos-containing materials in the performance of their duties were not considered to be at risk of developing any asbestos-related disease based upon their types of exposures – and the associated level, duration, and frequency of these exposures. Therefore, they were not typically provided with warnings about asbestos hazards that were thought applicable only to unrelated trades with much more intense exposures – unless the asbestos exposure and release conditions warranted such a warning – such as those found during a shipyard overhaul period – and that warning was associated with processes involving external thermal insulation containing asbestos and not the handling and use of gasket and packing materials, or electrical components. This practice was fully consistent with the state-of-the-art as discussed above by Dr. Irving Selikoff. No additional warning by a manufacturer and/or vendor of equipment (like turbines, boilers, valves, pumps, or electrical equipment), was going to change this well-accepted fact – until the period of OSHA with new scientific and medical information and correspondingly massively increased attention and research on this national "Target Health Hazard" (DoL, 1972). Under OSHA, the statutory, "Permissible Exposure Limits" for asbestos were appropriately lowered as the developing state-of-the-art knowledge indicated the need. Further Federal regulations and mandatory controls were enacted in the early 1970s; these regulations were placed on the employer of the workplace, or the business entity generating asbestos-containing waste, and covered literally all aspects of asbestos use, exposure, and disposal.

56. The occupational exposure level of 5 MPPCF continued to be used by the Navy, as well as other Federal agencies and many states, through the 1960s. However, this long-held "acceptable" occupational exposure concentration was re-evaluated in light of evolving scientific and medical knowledge and underwent incrementally significant reductions following the enactment of the Occupational Safety and Health Act in 1970. (US Congress, 1970) A national, statutory occupational exposure level, now called the "permissible exposure limit (PEL)", did not exist until the promulgation of the Occupational Safety and Health Act, and later as published under the asbestos dust standards (DoL, 1972). Although when enacted, this

national legislation specifically excluded military personnel in unique military workplaces and also did not address occupational health and safety during wartime or military conflict conditions, it did include private shipyards and all personnel working in those yards, as well as other industrial and commercial sites and facilities. The Navy had also adopted its own exposure standards (prior to OSHA) based upon the same occupational exposure levels later established as statutory limits under OSHA (BuMED, 1955; DoN, 1971; BuMED, 1973, and OPVAV, 1974). As mentioned previously, the Navy also took further additional steps to eliminate the use of asbestos as a thermal insulation through its "Asbestos Elimination/ Substitution Personnel Protection Program". (COMNAVSEASYSCOM, 1975)

57. Similarly, under the US Environmental Protection Agency National Emission Standard for Asbestos (US Congress, 1971); National Emission Standard for Hazardous Air Pollutants for Asbestos – "Asbestos NESHAP" (EPA, 1973); and the Toxic Substances Control Act (TOSCA) (USEPA, 1976), asbestos became regulated as a controlled environmental pollutant. Even then, operators of equipment in occupational settings were not, under normal working conditions, expected to be at risk of exposure to asbestos dust levels in excess of the existing PEL. And, to the extent that specific working conditions at a specific workplace did create such a risk, under OSHA, the duty of educating, protecting, and warning the worker fell explicitly upon the employer, as well as the manufacturers of the asbestos materials at issue. Trade unions also became involved. The AFL-CIO – the federation of labor organizations which worked closely

with Irving J Selikoff, MD to evaluate and control the hazards of asbestos exposure among their workers was also very active in the development of national labor legislation. The AFL-CIO President, George Meany, called the Occupational Safety and Health Act passed in 1970 ***". . . a long step … toward a safe and healthy workplace."*** (New York Times, 1970). When President Nixon signed this milestone Act of 1970, George Meany and other labor figures were present at the ceremony held at the Labor Department. As the control of exposure to asbestos was one of the five major health hazards targeted by this new legislation (DoL, 1972), the labor unions became even more active in identifying excessive asbestos exposures in the workplace and educating their members regarding asbestos hazards and the means of controlling exposure. This union activity actually dated back to the early 1960s. (Sickles, 1961; 1962) Under OSHA, the employers, unions, as well as workers themselves, were all considered to be the important components in maintaining safe and healthful workplaces. Most certainly, shipyard labor unions were very involved in the enactment and enforcement of these standards.

58. Indeed, the Navy stayed abreast of developments regarding the hazards of asbestos and developed sound approaches to the control of exposure to excessive asbestos fiber levels, as evidenced by several programs at various shipyards during the pre-OSHA period before 1970. In the late-1950s, Mr. WT Marr at Long Beach Naval Shipyard, where CAPT Wynkoop, USN had appropriately directed the attention of the Commanding Officers of ships entering the shipyard to the hazards of the overhaul period and provided support personnel and personal protective

equipment in 1947, was investigating alternate sampling and measurement techniques for the evaluation of asbestos – well before the change from a methodology using particle counting to one evaluating fiber length and concentration. The "Grim Reaper" poster emphasizing the need for insulators to wear a respirator when working with asbestos was a product of unionized labor and the safety department at this yard in the early 1960s. At the Boston Naval Shipyard, Mr. Storlazzi was continuing to practice state-of-the-art occupational health and industrial hygiene which had been started by CAPT Jenkins in the late 1930s. One of the earliest commissioned Industrial Hygiene Officers in the Navy, Mr. Seymore Levinson, continuing the work in which he was trained in 1942, directed the industrial hygiene program at the Norfolk Naval Shipyard in the 1960s where he provided exposure assessments and recommendations at this facility. (Levinson, 1965; 1967; 1969)

59. The Puget Sound Naval Shipyard (PSNSY) had a well-established occupational safety and health program which included an asbestos control program. As practiced throughout the Navy, this program was based upon the worker's exposure potential. Mr. CW Richards was the representative from Puget Sound Naval Shipyard in attendance at the Navy-wide "Pipe and Copper Shop Master Mechanics Conference" held in Boston in 1958. At PSNSY, specific program documentation dates back to the "General Safety Rules Manual" promulgated in 1950. (PSNSY, 1950) In this Manual, the following is stated:

> ***"Wherever there are fumes, irritating vapors or heavy dust present in the atmosphere, respiratory equipment is necessary***

> ***for your protection. Consult your supervisor for advice on any problem that may arise. (See Section N, Rules on Personal Health.)***
>
> ***"N4. <u>Wear dust type or air–fed respirators</u> for chipping red lead paint, <u>handling amosite or insulating materials</u>, while dressing abrasive wheels, while working exposed to dust from sand blast operations (wet or dry), and for any other dusty process where effective ventilation cannot be obtained."*** [EMPHASIS ADDED]

The potential hazards of asbestos were recognized by both tradesmen and occupational health personnel. In addition to providing an overview of insulating materials, the Master Mechanic of the Pipe Covering and Insulation Shop (Shop 56; PC&I) manual on "Marine Pipe Covering and Insulation" adopted in May, 1961 addressed worker safety training.

> ***"Marine Pipe Covering and Insulating" has been assembled through the research efforts of Shop 56 under the direction of the Master Mechanic.***
>
> ***Utilization of this technical trade manual in the field of pipe covering and insulating will <u>improve the vocational and production skills of our present craftsman</u> as well as to <u>"afford intangible benefits in training of new employees.</u>***
>
> ***Chapters I through III will <u>present an interesting introduction to our Navy's magic fibers" which make possible unlimited operating temperatures and pressures</u> in***

> ***such critical piping as HIGH PRESSURE STEAM propulsion while affording maximum protection to our operating personnel.***
>
> ***Chapters IV through VI will introduce Pipe Covering and Insulating tools, machinery, and insulating material with their layout and installation.***
>
> ***Chapters VII through X will afford intangible technical data for reference or application.***
>
> ***It is with the profound interest and best wishes of our trade we present this manual."*** [EMPHASIS ADDED]

This 1961 Manual also provided handling guidance for insulation materials in order to minimize the generation of dust, as well as requiring the use of respiratory protection when appropriate. Using lay terminology and basic medical concepts, the Shop's Master forcefully addresses his supervisors and tradesmen:

> ***"Characteristics of the pipe covering and insulating operations in the shipbuilding industries are such that proper personal safety precautions must be adhered to at all times. Each individual pipe coverer and insulator employee is required to check out and use a respirator when working in insulating areas where there is any danger from exposure to harmful insulating dusts. Supervisors should ensure that their men are properly protected at all times with proper safety equipment and adequate ventilation. Supervisors are not***

relieved of responsibility by merely instructing their men to use safety equipment, they are obliged to follow up and ensure that protective measures have been implemented for their crew's health and welfare.

Industrial dusts of all forms have long been thought of as a production evil. Sometimes taken quite seriously, and sometimes taken with a grain of salt, or we might add sardonically, with a micron of silicosis.

Proper control of all harmful industrial dusts can be obtained only through the combined efforts of the workers and management working together to minimize exposures to critical dust and fumes.

The "old timer" or "smart character" may look on humorously as an informed and cooperating worker carefully adjusts his respirator before ripping off reams of amosite or asbestos piping insulation preparatory to a piping alteration. However, it will be the cooperating worker who will have the healthier pair of lungs at the end of the day.

While "Pneumoconiosis" is the technical term applicable for such infections as "Miner's Asthma", "Miner's Phythisis,"(sic) ""Grinder's Rot," (sic) and many others, "Asbestosis" and "Silicosis" are the two most harmful and common lung infections of the pipe covering and insulating trade.

> . . .
>
> ***The <u>infectious characteristics of insulating materials</u>, such as diatomaceous earth (a form of amorphous Silica), asbestos dust, glass or rock wool, and Magnesia, <u>are harmful and do damage to the respiratory system when breathed in excessive and constant amounts</u>."*** [EMPHASIS ADDED]

The Shop's Master used a hand-drawn picture of the human lungs and airways to stress his point of physiologic fragility and the need to comply with safety and health precautions:

> ***"An example of the lung structure with its delicate parts has been included to <u>stress the importance of proper safety or health precautions while performing pipe covering and insulating operations</u>."*** [EMPHASIS ADDED]

The Puget Sound Naval Shipyard's asbestos control program had many other notable developments. Mr. CA Mangold and the occupational health staff at the Puget Sound Naval Shipyard were also very active at this time developing worker education programs while controlling excessive exposure to airborne asbestos fibers in accordance with Navy instructions and statutory Federal requirements as they were promulgated. (PSNSY, 1950; Mangold, 1965; PSNSY, 1966; Mangold, 1967; Mangold, 1968; Mangold, 1969a,b; BUMED, 1969; Barboo, 1969; McBratney, 1969; Mangold, 1970; Beckett, 1976) Training lectures, such a "Practical Industrial Hygiene and Toxicology" were developed for employees and presented by the Industrial Hygiene Department. (PSNSY, 1965) Technical guides for ventilation (Mangold, 1967; Mangold, 1969a) and respiratory protection (PSNSY, 1966) were also developed by the Industrial Hygiene Department to aid supervisors in the performance of the safety aspects of their positions. Concerned about their medical monitoring findings in light of the industrial hygiene data for the insulators and other industrial trades at the PSNSY, the Medical Department not only informed the workers of their concern (Mangold, 1969a,b; PSNSY, 1969), but also took the initiative to disseminate their findings to other occupational health professionals both inside (Manning, 1968; McBratney, 1969; Mangold et al., 1970) and outside of the Navy (Mangold et al, 1968). The final report of Mangold and his coworkers work on "Asbestos Exposure and Control at Puget Sound Naval Shipyard" (1970) was approved and released by the shipyard Commander, RADM EW Petrovik, USN in March, 1970. This Program was highlighted by the Navy Bureau of Medicine and Surgery for its excellence, and photographic images of shop and ship asbestos control measures in use at Puget Sound Naval Shipyard were put on display at the Bureau in Washington, DC. The information distributed to occupational health personnel throughout the Navy. (Barbee, 1969)

60. The Navy also took further additional steps to eliminate the use of asbestos as a thermal insulation through its "Asbestos Elimination/Substitution Personnel Protection Program" (COMNAVSEASYSCOM, 1975; COMNAVSEASYSCOM, 1976). As the general state-of-the-art medical knowledge regarding the inhalation of asbestos fibers evolved, as well as the development and availability of suitable substitute non-

asbestos materials progressed, the Navy adopted a measured program to replace asbestos thermal insulation. As Vice Admiral Bigley, speaking for the Chief of Naval Operations, acknowledged in his letter dated 5 January 1979 to the General Accounting Office (Bigley, 1979):

> ***"In the case of insulation specifications, changes were made as early as 1971 to specify that the Navy wanted materials with little or no asbestos. By late 1973, these specifications had been changed to call for asbestos-free materials. The fact, however, that these product specifications were changed to call for asbestos-free materials does not mean that ship-builders must stop using asbestos products. Many ship-sets of asbestos containing products, purchased to earlier versions of the product specification had already been bought and in some cases installed. Tens of thousands of pounds of asbestos products remained in warehouses, aboard ships, and in shipyards, in active use. With no positive action by the Navy, many additional years would pass before the asbestos products were exhausted. Although, in some cases, separate action by some Navy components resulted in the asbestos-free products being used prior to 1973 or 1974, the overall Navy policy prohibiting the use of such material could not be promulgated until we had some assurance that it could be followed. By 1975, asbestos-free materials were generally available to all Navy***

> ***agencies and the no-asbestos policy statement, NAVSEAINST 5100.2 of 24 October 1975 issued."***

Admiral Bigley further noted that although ship purchase contract specifications were changed for some ship classes in 1971, the change for all ships classes was not accomplished until later:

> ***". . . Ships well under construction and already insulated at that time continued through to delivery as late as May 1978 with asbestos insulation. Consequently some ships were delivered with asbestos thermal insulation since 1973."***

Admiral Bigley (1979) further addressed the removal of asbestos from existing shipboard installations:

> ***"Regarding removal of all asbestos aboard Naval vessels, Navy policy has required replacement of asbestos insulation with substitute material when insulated equipment and machinery are repaired. Recently, this policy has been modified to require, in addition, selective replacement of asbestos insulation in those high-maintenance areas where repairs may be anticipated during the subsequent operating cycle of the vessel. During the next five years, implementation of this policy will result in the removal of all shipboard thermal asbestos except that 30 to 50 percent which is normally untouched during the life of the ship.***

The concept of a one-time total asbestos removal on all ships has been-under intensive review to determine if such a policy revision is technically and economically feasible. Initial analysis does not justify such a policy change. While there is no intention to conduct a trade-off of human health for maintenance and repair funds, the funds involved are substantial. As indicated above, the estimated cost to reinsulate just three classes of ships (frigates, destroyers, and submarines) is $965.13 million. It is reasonable to assume that the estimated cost for total asbestos replacement in 'all ships will approach two billion dollars. The–true cost is likely to increase significantly because of delay and disruption effects, increased overhead charges due to longer overhauls, and increased shipyard manning to handle the added work. This enormous cost is not the only reason that the Navy has not adopted a one-time total asbestos removal policy. Other factors which support the present policy are the following:

a. During the life of a ship, 30 to 50 percent of the total asbestos insulation will never be touched except for painting or making minor repairs to the lagging cover material. Measurements show that operating ships equipped with asbestos insulation have airborne asbestos levels at or below 0.1 fibers per cubic centimeter. This value

is comparable to the ambient level reported for the City of Philadelphia by Dr. Irving Selikoff, a well known asbestos expert. Therefore, on the basis of existing information, a properly maintained and operating ship should not present an active asbestos hazard.

b. The Navy requires and enforces stringent asbestos work standards which control exposure of workers to asbestos dust during ship repair. By minimizing the amount of asbestos work done, the potential exposure, residual dust, and overhaul cost are minimized.

c. Fibrous glass and calcium silicate products are being used as asbestos replacements. The National Institute for Occupational Safety and Health has recommended controls for fibrous glass work that are nearly identical to the controls now imposed for asbestos work. It seems reasonable to assume that if the Institute recommends nearly identical controls for two similar substances, comparable hazards could be known or suspected. Therefore, it is not at all certain that wholesale replacement of asbestos products gains any medical advantage at all.

d. Despite the enormous cost, replacement of asbestos thermal insulation in ships will not eliminate asbestos exposure of civilian and military Navy

> ***personnel. According to the National Institute for Occupational Safety and Health, asbestos dust is everywhere. Low but easily measurable levels of airborne asbestos dust are found in the air of cities throughout the country, much of it generated by automotive brake and clutch linings. Asbestos is used in so many products that most of the U. S. populace unknowingly encounters it daily."***

61. As discussed previously, the potential exposure of active duty Sailors to significant levels of asbestos fibers was only recognized under unusual conditions – such as periods in which ships were "in the yard" for overhaul or undergoing significant maintenance or repair (Wynkoop, 1947). Similarly, based on the state-of-the-art in industrial hygiene and occupational medicine available at the time, the duties that were thought to put civilian shipyard workers at risk for potentially significant asbestos inhalation exposures were largely limited to prolonged installation and removal projects by workers in the pipecovering trade (insulators). The Navy had both a well-based and well-established program for the control of the hazards of asbestos based upon the state-of-the-art, and, in consideration of its responsibility for national defense, made appropriate and informed decisions to specify and use asbestos for Navy ships. These programs were appropriately delivered through the Commanding Officers of each Naval activity – the individuals with ultimate Navy authority and responsibility. There was not an equipment manufacturer, nor a vendor, in a position to offer better advice to the US Navy

before the enactment of the Occupational Safety and Health Act in 1970. And after 1970, and through the present time, the Navy's occupational health program continues to reflect the state-of-the-art in national safety and health policy and procedures, and to maintain readiness for national defense.

DISCUSSION AND ANALYSIS OF RISK-BALANCING BY THE NAVY RELATIVE TO ASBESTOS EXPOSURES AND THE HEALTH OF NAVY DEPARTMENT PERSONNEL

62. The Navy weighed its knowledge of the hazards created by the use of asbestos containing materials against the vital operational benefits provided by its use. The Navy controlled asbestos exposure consistent with the then current state of accepted scientific and medical knowledge balanced by needs for national defense throughout the various periods of its use. The Navy's asbestos control program, at all times discussed above, was multifaceted and complex, and included hazardous process identification, engineering controls, use of alternative materials in accordance with Navy specifications and contract requirements, personal protective equipment, training and education, and medical surveillance – all when indicated by the level of exposure to airborne asbestos fibers.

63. In all, it was the Navy (or analogously Coast Guard and Coast Guard personnel), with Congressionally-designated authority for operating and controlling the shipboard and activity/facility environments, workplaces, and types of materials, methods, and tasks to which Navy Sailors were assigned and where civilian personnel worked. The Navy accepted this role and responsibility in the performance of its

mission. The Navy established and followed an occupational health program that protected its personnel – its most vital resource – so that they could carry out their tasks in support of the Navy's mission. Without its Sailors, a ship would be nothing more than an object either moored to a pier or floating aimlessly upon the sea; without its ships – and its Sailors – there would be no Navy. The Navy's civil service personnel were no less expendable as essential participants in maintaining the Navy's state of readiness.

64. As discussed above, Sailors in the engineering ratings "steam the ship" by operating the equipment. While it is certainly true that maintenance and minor repairs are performed, the vast majority of time is spent operating the various steam-driven equipment. The major units of propulsion machinery onboard a Navy warship (along with their appurtenances and associated equipment like piping and valves) are specifically designed to be highly reliable pieces of equipment which require nominal maintenance during normal operation. During the periods relevant to this report, the types of tasks which were routinely performed by shipboard personnel while operating this equipment were not considered by Navy occupational health professionals to result in exposure to asbestos fibers which would exceed the allowable occupational exposure level; they were not considered to be hazardous tasks – at least with respect to asbestos. To the extent Sailors experienced any exposures to asbestos-containing materials associated with equipment during their normal duties onboard ship, except in exceptional circumstances, these would typically have been medically and clinically insignificant and well below

the allowable permissible exposure limits of the period. The major contribution to meaningful asbestos concentrations onboard a Navy ship of this era was from amosite asbestos fibers released from friable thermal insulation used on piping and other steam systems throughout the ship. However, even these airborne fiber levels were well below the accepted exposure levels of the period and not considered to be hazardous to personnel.

65. Navy and civilian personnel working onboard ships and other vessels obviously worked around various equipment ranging in size from the very small – to the enormous. However, except in exceptional circumstances, Navy Sailors operating and maintaining equipment while performing accepted work practices would not typically have been exposed to airborne levels of asbestos fibers arising from gaskets, packings, or insulation on any piece of equipment which exceeded the accepted occupational exposure levels at the time. If exposure to airborne asbestos fibers was expected to exceed the accepted occupational exposure level at any given period in time, both during the pre-OSHA and post-OSHA periods, personal protection and other industrial hygiene controls were required. It should be noted that the equipment used in a Navy ship's machinery spaces – like turbines, boilers, pumps, valves, etc. – are typically shipped and installed without external thermal insulation. If thermal insulation was required by Navy specifications, the external insulation was provided and installed by the shipbuilder or repair activity after initial installation.

66. The presence and content of asbestos in thermal insulation, as well as gaskets and packings and

other materials used in naval construction, is variable. Unless qualitatively and quantitatively determined in a scientific manner, the presence, type, and concentration of asbestos cannot be determined in either the material or in the air. From the industrial hygiene standpoint of controlling potential hazardous inhalation exposure to asbestos, it may be assumed that much of the thermal insulation and other materials, such as gaskets and packings, used in the construction and maintenance of naval vessels contained asbestos roughly during the era of the 1940s through the 1960s; however, only proper evaluation and determination by trained and qualified individuals can scientifically and conclusively make the determination. Without such evaluation, it cannot be known whether and to what extent the products, and the "dust" purportedly identified by witnesses not trained in applicable industrial hygiene methods, actually contained asbestos.

67. The Navy's total occupational health program operated within the Navy organizational structure (chain of command) and was designed to maintain functionality in the completion of the Navy's mission while controlling untoward exposure to airborne asbestos fibers to all Naval and civilian personnel. The ability of the Navy to operate and fulfill its mission rests upon many critical elements, the greatest of which are its Sailors. However, real world considerations such as funding, political and other current events, and natural and man–made catastrophes also impact senior Navy leadership's final decision in all matters. By the very nature of the Navy's mission, it is a combatant force and the Navy's leaders ("war fighters") must thoughtfully elect to place Sailors "in

harm's way" to protect the country and its vital interests – as directed by President. Although these actions may result in casualties or death of Navy personnel, these types of decisions must be made for the good of our Country – its daily existence, its defense, and its survival. The Navy's occupational health program, including its asbestos exposure control program for over the vast majority of the 20th Century, was directed at maintaining a fit and healthy fighting force in support of accomplishing the Navy's mission and maintaining its combatant and support vessels, aircraft, missiles and other essential equipment – as well as providing essential occupational health resources for its civilian personnel.

68. As the occupational exposure level for exposure to airborne asbestos fibers decreased over the period of the late 1960s, and more so in the early 1970s under OSHA, the Navy and private, regulated shipyards and other industries further increased their vigilance for the control of exposure and instituted further industrial hygiene controls including: the substitution of asbestos in thermal insulation where possible; use of products containing lower amounts of friable asbestos; increased training; control of potential exposure to asbestos fibers of non-involved or unprotected personnel; posting of a warning; and the designation and education of individuals specially trained and equipped to handle asbestos in order to minimize the release of asbestos fibers. The use of asbestos-containing products has continuously decreased since the late 1960s and the potential for direct and background exposure has concomitantly decreased. The increased control of potential exposure to respirable asbestos fi-

bers was performed by the Navy while it still maintained a fighting force and provided for the Country's national defense. In addition to the post-OSHA regulations, as a matter of practicality and economic necessity, regulated industries also followed the trend of removing and replacing, or encapsulating/enclosing, potentially friable asbestos sources and materials. After the late 1960s, the composition of any thermal insulation, construction, or other previously known asbestos- containing product cannot be assumed.

69. As described above, the expertise of the Navy, with respect to the specification and use of asbestos, and the health hazards associated with its use onboard Navy vessels, far exceeded any information that possibly could have been provided by an equipment manufacturer. Additionally, the boiler, turbine, electrical, and auxiliary equipment manufacturers have absolutely no authority, responsibility, or control over the operating workplace or personnel – both essential aspects of hazard communication. Concomitant with the huge increase in shipbuilding during World War II, the Navy developed a robust and multifaceted occupational health program which addressed many health risks. Over a quarter-of-a-century before the enactment of the Occupational Safety and Health Act of 1970 (US Cong, 1970; PL 91-596), the Navy had an asbestos control program in place which contained most of what was later required for non-military workplaces under this first national legislation controlling occupational exposure to asbestos. The Navy's program far exceeded the mere provision of a warning placard or note in an instruction or operation manual. The major aspects of the Navy asbestos control program existed before OSHA and have continued,

with modifications, to remain consistent with the evolving state-of-the-art knowledge and statutory requirements of OSHA. The Navy's early program included the:

(1) adoption of an occupational exposure level (five million particle per cubic foot (5 MPPCF);

(2) establishment of the methodology to evaluate exposures;

(3) training and equipping an occupational health team with state-of-the-art knowledge and equipment;

(4) development and specification of engineering and administrative controls where required;

(5) establishment of a proactive medical surveillance program applying SOTA monitoring techniques incorporating pulmonary function testing to detect early changes with greater sensitivity than using chest radiographs alone (chest radiographs reveal later-developing changes);

(6) the wearing of approved respiratory protection for tasks performed when exposure levels were expected to exceed the accepted, "time-weighted average" concentration;

(7) recordkeeping; and

(8) training (hazard awareness) – and later more requirements were added consistent with the developing state-of-the-art and Federal and Navy requirements.

70. The Navy controlled exposure to asbestos consistent with the then current state of accepted scientific and medical knowledge balanced by needs for national defense. Sailors did not have the option to avoid exposure to asbestos-containing products or environments in which asbestos was used while on active duty. Certainly, Navy vessels built and/or overhauled in the 1940s through the 1970s often contained large amounts of asbestos which covered steam-driven equipment and thousands of feet of thermal-insulated pipes. These insulated lines traversed the entire vessel including non-engineering work spaces, as well as eating and berthing spaces.

71. In light of the Navy's knowledge regarding the potential asbestos-related health hazards from exposure since the 1920s (well before the large increase in specification by Navy designers, architects, and engineers), and the known military and technologic benefits or advantages afforded by the use of asbestos as thermal insulation and in other applications, the Navy made an informed decision to use asbestos-containing products. The Navy was fully cognizant of potential health hazards when it specified use of asbestos in applications critical to national defense and the conduct of war. To insure that the health of military and civilian personnel was maintained, the Navy established a sound, premier state-of-the-art occupational health program to control the recognized, potential health hazard.

72. To carry the concept involving the offering of a written warning by an equipment manufacturer further, as the Navy had determined what an "acceptable asbestos exposure" was, the Navy would not, nor could

not, allow each sailor to make an additional determination of what constituted an acceptable exposure on an individual basis. This is not only true for determining whether or not one would accept an asbestos exposure, but also all of the dozens of other daily potentially hazardous exposures (including to an armed enemy) that confront personnel. Navy specifications or instructions, as well as my decades of experience as an officer rising to the rank of Navy Captain, do not support the notion that manufacturers of equipment were free to provide additional warning information about hazards associated with products – especially those (like insulation) that they typically neither manufactured nor supplied.

73. Based upon review of many documents regarding the Navy's hazard communication program, and based on my career experiences as an Industrial Hygiene Officer and a physician in the Navy dating back to 1972, and personal knowledge of the Navy's hazard communication program and Naval practices generally, it is indisputable that uniformity and standardization of any communication, and in particular safety information, are crucial to the operation of the Navy. The Navy had a sound, occupational health and safety program based upon its requirements and conducted in accordance with Navy regulations, instructions, and operational necessities. Simply, the Navy could not operate if various personnel were trained differently and received additional, inconsistent information from different manufacturers.

74. For example, SECNAV Instruction 5100.8 ("Uniform Labeling Program - Navy, 26 September 1956) – which is an internal Navy directive from the Secretary of the Navy directing Navy personnel, not

manufacturers of material or equipment, of the manner in which to carry out their obligations – Para.1 states: ***"The purpose of this Instruction is to standardize labeling requirements for hazardous chemical products during usage..."***

75. Further to this goal of standardization, the Navy itself undertook the responsibility of developing, promulgating, and enforcing safety precautions for equipment maintenance. Indeed, the instructional manual provided to all new Navy Sailors (Bluejackets' Manual, 1965) provided:

> ***"Your CO has been assigned safety as one of the functions of his command. He, your XO, your department head, division officer and petty officers are required to see to it that their men are instructed in appropriate safety precautions. These officers are required to make sure that each of their men know and practice safety precautions.***
>
> ***. . .***
>
> ***Navy Bureaus and Offices study the equipment for which they are responsible and then publicize the safety precautions to be followed. Safety precautions that are instrumental in avoiding preventable accidents and maintaining a healthy work environment have been gathered into a publication entitled 'Safety Precautions, Department of the Navy.'"***

These Navy safety instructions referenced (Department of the Navy Safety Precautions, NAVSO P–2455, 1965) in this Bluejackets' Manual specifically set forth the Navy's official procedures for asbestos safety:

"Exposure to asbestos dust is usually encountered in the installation, repair, and removal of insulating pipe covering used principally aboard ship. The following precautions should be taken in any dust making operations involving asbestos products:

a. Provide permanent general ventilation in areas where dust producing operations are usually performed.

b. Install exhaust hoods over saws and other dust making machine tools.

c. Require workers to wear dust respirators where dusty operations cannot be adequately ventilated.

d. Use industrial vacuum cleaners in lieu of dry sweeping of floors and other surfaces."

As discussed previously, as the state-of-the-art of asbestos hazard awareness developed within the medical and scientific community, these procedures were repeatedly superseded by ever more sophisticated Navy asbestos safety policies (NAVSHIPSINST 5100.26: "Control of Asbestos Hazards", COMNAVSHIPSYSCOM, 1971; Naval Ships Technical Manual, Ch. 9390: "Thermal Insulation, Safety Precautions for Asbestos," 1972; OPNAVINST 5100.19: "Safety Precautions for Forces Afloat, CNO, 1973; COMNAVSEASYSCOM, 1975).

76. In contrast, the Navy promulgated detailed specifications regarding the content of equipment

manufacturer technical manuals – with specific examples of safety instructions that should be included (Military Specification – Technical Manuals for Mechanical and Electrical Equipment, MIL-M-15071 (SHIPS)). Similarly, the Navy promulgated detailed specifications for the form and content of information plates to be displayed on shipboard equipment (Military Specification – Identification Plates, Information Plates and Marking Information for Identification of Electrical, Electronic, and Mechanical Equipment, MIL-1-15024 (Ships). These two specifications specifically governing the content of written materials – including safety instructions dealing with operation and maintenance – to be provided by military equipment vendors are both completely silent regarding asbestos. However, such countless equipment manuals, identification/ information/markings provided under contract terms by numerous manufacturers were reviewed, accepted, and used by the Navy for decades. It is obvious that these were not the methods nor instruments chosen by the Navy to control exposure to airborne asbestos fibers—this was a health-related matter addressed and controlled via another preferred route.

77. Indeed, any additional warning about the hazards of asbestos by an equipment manufacturer – beyond those already provided and enforced by the Navy – would have been only partial in scope, as well as inherently redundant and possibly inconsistent with the Navy's own position and training. In the heat of battle, there is simply no time to be interpreting inconsistent hazard labels.

78. It has been my understanding, which has been supported by my experience, that literally all Navy

sailors serving on ships in the WWII era and through the late 1960s knew and/or assumed that the high temperature thermal insulation used on naval steam system pipes and equipment contained “asbestos”. The exact type and composition of the thermal insulation may not have been known, but the use of asbestos for such application was so universal that identification of external thermal insulation on such hot steam system lines and equipment that the insulation was usually assumed to be “asbestos” – even in instances where it was replaced with fibrous glass, mineral wool, or other non-asbestos materials, or used as a minor component in an “85% Mag” product (85% magnesia: 15% “asbestos”). This was still the practice when I was commissioned in 1972. As a fundamental aspect of Navy training and practice, dust control and a high level of general cleanliness, even in the engineering spaces, were routinely maintained as part of the standard Navy shipboard environment—spaces were kept “shipshape”.

79. At most, an equipment manufacturer could merely have told personnel to follow the Navy’s own mandates for handling asbestos. Potentially redundant information is not informative, and diverts attention from hazards inherent in the equipment, and would certainly become obsolete. For example, the life expectancy of propulsion equipment onboard ship is many years, while military specifications and program emphasis (such as the Navy’s asbestos hazard communication program) change much more frequently and have evolved over the years to keep pace with scientific developments and changes in materials. Static warnings about asbestos hazards provided with

equipment intended to operate for decades would have been outdated and inaccurate almost immediately.

80. There are additional, sound reasons why the Navy did not want unsolicited and potentially inconsistent warning information from equipment manufacturers regarding asbestos insulation (or any other product) which was provided by other vendors or contractors. If every equipment manufacturer (and conceivably even the pipe and structural steel manufacturers) provided its own warning about asbestos insulation that might be used on or around its product, inconsistent warnings from these various sources would certainly have resulted. And, keep in mind, many other hazardous substances (e.g. boiler feed water chemicals, fuels, solvents, heavy metals) are used in conjunction with the multitudes of equipment on a ship. If each was to warn about all the possible substances that might be used on or around its equipment, sailors would quickly become inundated with inconsistent information on a myriad of substances.

81. Moreover, materials like external thermal insulation are periodically removed and replaced, and some types of insulation used by the Navy on equipment were non-asbestos (e.g., fiberglass blankets). Warning about asbestos on equipment where insulation – initially asbestos in the 1940s or 50s – was later replaced with non-asbestos insulation – in the 1960s or 70s – would simply be wrong. Military specifications for thermal insulation over time allowed an assortment of materials – as determined by a number of critical design and materiel availability parameters. As early as 1952, MIL–I–16411 A addressed a non–asbestos thermal insulation felt that was suitable for use on steam turbines and other machinery and

equipment operating at temperatures to 1,200°F – if selected by the naval design engineers and builders. After delivery of the equipment, how would the equipment supplier know what insulation material would be used in future repairs, overhauls, and conversions made one, two, or more decades in the future?

82. MIL–M–15071D, para. 3.3.1 makes it clear that equipment manufacturers' manuals must first be approved by the Bureau of Ships and ***the "manual shall not be modified without approval of the Bureau of Ships."*** Thus the Navy and/or its agents reviewed and approved the content of all equipment vendor manuals. In all cases, it was the Navy that exercised final discretion over what warnings to provide, or not provide, in equipment technical manuals. Moreover, it cautions: ***"Notes, cautions, and warnings should be used to emphasize important critical instructions. The use should be as sparing as is consistent with real need."*** This specification applies to risks inherent in the operation of the equipment; unsolicited and gratuitous warnings about the possible use of materials made and sold by others do not comport with this specification. The concepts of "safe", "hazardous", and "toxicity" have changed over the past decades. Specifically, as late as 1964, the American College of Chest Physicians in its treatise on "Asbestosis" noted: ***"Asbestos is not currently considered a toxic substance since it does not produce systemic poisoning."***

83. Lastly, but importantly, equipment manufacturers are not subject matter experts regarding the health effects or industrial hygiene controls associated with the use of asbestos-containing insulation materials in naval applications. It is unreasonable to

speculate that the Navy would have accepted "helpful comments" from a vendor or equipment manufacturer concerning a material or substance provided by another vendor or supplier in which it was not a subject matter expert. And in any event, the Navy already had this specific expertise, and more – and understood its own basis for specifying asbestos-containing products onboard ship. The Navy already had a robust and encompassing occupational health program, working in concert with the Navy's operational, engineering, and maintenance and repair facilities, that far exceeded just the mere labeling of a material. This program included aspects appropriate for the degree of recognized hazard at various times including training, engineering controls, medical examinations, provision of personal protective equipment, and the use of alternative products when possible. It is thus not surprising that the Navy, with its inherent authority used its discretion, consistently reviewed and approved manuals for thousands of pieces of shipboard equipment without redundant – and potentially inaccurate and conflicting – "asbestos warnings".

84. The naval or military setting is unique and distinct, and although management structure is generally similar, the command hierarchy of rank is well-defined and the authority of the Commanding Officer approaches absolute. This authority is based in Federal statute, as well as in Navy Regulations and Instructions. Over time, there have been evolutionary changes in these to incorporate changing societal values, but the authority of the individual in command remains constant. When routine "orders" are given, prompt and appropriate response is expected. The failure to obey a lawful order is a punishable offense,

and depending upon the situation (war time, national emergency, misconduct), the punishment can be severe. Individual freedoms that are common to civilians are not as universally applied to military members, or even civilians working onboard Navy ships in Federal and private shipyards. Civil liberties indeed exist, but they are tempered to the strict Uniform Code of Military Justice (UCMJ) and the requirements for national security. To suggest that a government contractor supplying equipment used in a critical shipboard propulsion system had the autonomy to place whatever instructions it wanted onboard Navy warships, or other naval vessels – as simply as commercial manufacturers might add a label to a consumer product – is misleading and false.

PRIVATE EMPLOYER RESPONSIBILITIES

85. Prior to the enactment of the Occupational Safety and Health Act of 1970, the universally- recognized occupational exposure level in the United States for airborne asbestos particles (not fibers) was 5 million particles per cubic foot (5 MPPCF) or equivalent to approximately 30 fibers per cubic centimeter (30 f/cc). This level had been previously widely-accepted by health professionals and regulators in the United States since the late 1930s.

86. When OSHA first regulated asbestos in 1971 under authority of section 6(a) of the Occupational Safety and Health Act, it also adopted this value which existed as the Federal standard for asbestos under the Walsh–Healey Public Contracts Act. On May 29, 1971, the initial OSHA Permissible Exposure Limit (PEL) of 12 fibers per milliliter (or cubic centimeter ("12 f/cc" greater than 5 microns in length by phase contrast magnification)), or "equivalent" of 2

million particles per cubic foot ("2 MPPCF" by impinger samples counted by light-field techniques) was published. An "Emergency Temporary Standard (ETS)" for exposure to "asbestos dust" was promulgated on December 7, 1971, which reduced this value to 5 f/cc (with a 10 f/cc ceiling limit not to exceed 15 minutes in 1 hour for up to 5 hours/day). This ETS was in response to a petition by the Industrial Union Department of the American Federal of Labor-Congress of Industrial Organizations (AFL-CIO). The major shipyard workers' unions were affiliates of the AFL–CIO.

87. In June 1972, OSHA promulgated these limits in a final rule: "Standard for Exposure to Asbestos Dust" (Dol, 1972). The control of asbestos exposure to US workers was one of the five "Target Health Hazards" established under OSHA: (Dol, 1972b)

> ***"Focusing upon the need to create healthful working conditions, the Occupational Safety and Health Administration in January 1972, initiated the Target Health Hazards Program. The emphasis is on five hazardous workplace substances:***
>
> 1. ***<u>ASBESTOS</u>***
> 2. ***LEAD***
> 3. ***SILICA***
> 4. ***COTTON DUST***
> 5. ***CARBON MONOXIDE***
>
> [EMPHASIS ADDED]
>
> ***WHAT ARE APPROVED LEVELS? OSHA's permissible level is 5 fibers per milliliter greater than 5 microns in length for an***

> ***eight-hour, time-weighted average airborne concentration. This may be increased to 10 such fibers per milliliter for no more than 15 minutes per hour, up to five hours per eight–hour day. Imminent danger situations are generally not applicable. Any exposure greater than permissible levels for unprotected or improperly protected workers is considered a serious violation."***

88. In July, 1976, the OSHA PEL for asbestos was decreased from 5.0 f/cc to 2.0 f/cc; the ceiling concentration remained the same at 10 f/cc. At that point in time, even with a lower Permissible Exposure Limit, operators of equipment in typical shipboard settings and those operating and maintaining equipment which incorporated bound or non-friable asbestos materials were not, under normal working conditions, expected to be at risk of exposure to asbestos dust levels in excess of the existing Permissible Exposure Limit. These Federally-mandated permissible exposure limits (and corresponding Navy-directed occupational exposure limits), as well as all of the requirements for an "asbestos program" were in effect throughout the United States – and, of course, in a unionized shipyard facilities. In 1986, with considerable "fanfare", OSHA further reduced the Permissible Exposure Limit to one-tenth of its previous value – the Permissible Exposure Limit became 0.2 f/cc. This statutory limit remained in effect until 1994, when the Permissible Exposure Limit was further reduced to its present value of 01. f/cc. During the development and evolution of the "Asbestos Standard" over time, the National Institute for Occupational Safety and Health

(NIOSH) provided the scientific and medical "technical" support to OSHA; NIOSH was staffed with commissioned officers and civilians working for the Public Health Service. To the extent that specific working conditions at a specific workplace did create a risk based upon the airborne concentration of asbestos fibers and other use and exposure parameters, the Navy, as well as Federal laws, initially the WHPCA and "Safety and Health Regulations for Ship Repairing", and later OSHA, the duty of educating, protecting, and warning the worker fell explicitly upon the employer (or the Commanding Officer in the Navy or Coast Guard) – as well as the manufacturers of the asbestos materials at issue.

89. Additionally, the new environmental release and disposal requirements under the Environmental Protection Agency's (EPA) "National Emission Standard for Hazardous Air Pollutants for Asbestos (Asbestos NESHAP)" in 1973 also had to be concomitantly fulfilled. (US Congress, 1970b; EPA, 1973) As discussed elsewhere in this report, the evolving "Asbestos Standard" and other statutory requirements enacted under the Occupational Safety and Health Act applied to the Navy and the Coast Guard via a series of Executive Orders; they were implemented by a series of specific Departmental and service instructions which were carried out via the Commander/ Commanding Officer and chain-of-command. Processes and conditions which were "military unique" were specifically excluded; however, general Navy and private shipyard operations were directed to be consistent with OSHA and EPA requirements as they pertained to the handling, use, management, storage, and disposal of asbestos-containing materials.

90. Because of the risk created from having a large number of workers and a large amount of asbestos-containing materials present, civilian shipyards were specifically-targeted industries for the OSHA and EPA regulators regarding all aspects of asbestos use, handing, and disposal. Additionally, inspecting officials of the US Coast Guard, as well as privately employed individuals working in shipyards and onboard ships during construction, repair, or overhaul, were subject to the provisions of the Occupational Safety and Health Act. OSHA inspectors could go onboard vessels for inspections, but they were equally concerned about all shipyard safety and health conditions.

91. Any safety and health program must surely "start at the top" and include all levels of employees including management. The Navy's (and all US Governmental Departments' and Agencies') overarching Safety and Health Program includes and involves all levels of personnel from the highest levels of command (management) and supervision to the "deckplates" – the entry-level and unskilled enlisted and civilian personnel in the Navy Department.

92. As discussed throughout this report, the Navy had its own occupational health program which started before– well before the Occupational Safety and Health Act of 1970 (OSHA) – and continues to this date operating independently under Department of Defense Directives now as the Navy's Safety and Occupational Health Program. The Navy's program to control asbestos has always been the "State-of-the-Art". As discussed previously, prior to the enactment of OSHA in 1970 and its statutory implementation in 1971, employment conditions at private facilities,

such as shipyards and other industrial sites, were regulated under state and local laws, and, where applicable, Federal legislation ("Minimum Requirements" (1942)– updated for shipyards through the periodically revised and amended requirements of the Walsh-Healey Public Contracts Act (1936) and the "Safety and Health Regulations for Ship Repairing" (Dol, 1960)). The "Safety and Health Regulations for Ship Repairing" enacted in 1960 (Dol, 1960) state:

> ***"... safety and health regulations that have been determined by the Secretary of Labor to be reasonably necessary to protect the life, health and safety of employees engaged in longshoring, ship repairing, and related employments covered by Section 41 of the Longshoremen's and Harbor Workers' Compensation Act, as amended."***

These regulations were mandatory with respect to employers. Similarly, the numerous asbestos control requirements and health program aspects under OSHA were specifically directed to the employer and the workplace – not equipment manufacturers or suppliers. The scope of the OSHA asbestos regulations for employers was vast and the requirements were very specific. In a manner similar to the position accepted and taken by the Government, the employer, or controller of the workplace, had full responsibility for the control of occupational health hazards arising in or from the workplace. Under OSHA, it is the employer that has responsibility for providing a workplace that is free from recognized hazards (US Congress, 1970) and following the asbestos dust standards (Dol, 1972). Each employee also had responsibilities.

"(a) Each employer–

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct." [EMPHASIS ADDED]

OSHA was enacted:

"To assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes."

93. It was the employer, not the manufacturer of equipment used in a workplace, who was given the responsibility to control exposure to respirable asbestos fibers. Any worker's excessive occupational exposure after the enactment of OSHA was a likely result of a failure of the employer's specifically OSHA-mandated

comprehensive asbestos control program (or the Navy's program), and not from any purported lack of a warning by equipment manufacturers and suppliers.

CONCLUSIONS

94. As discussed throughout this report, the US Navy had a longstanding program to prevent excessive exposure to airborne asbestos fibers based upon the best available knowledge – it was the state–of–the–art. This program was initially directed at preventing the only known illness directly caused by excessive exposure to inhaled asbestos fibers – the clinical disease called "asbestosis". The association between this clinical disease "asbestosis" (not merely "exposure to asbestos") and lung cancer was not generally accepted until Doll's published work in 1955. The disease "mesothelioma" was not associated with different exposure conditions to one type of asbestos (crocidolite) until Wagner's publication in 1960. Until the middle of the 1960s, the development of mesothelioma was also associated only with the presence of asbestosis. Lastly, it was not until 1972 that exposure to amosite asbestos was demonstrated to cause mesothelioma by Selikoff and his coworkers. The Government's initial program was directed at preventing lung fibrosis – asbestosis-the recognized precursor of lung cancer and mesothelioma during that period. That was the state-of-the-art practiced throughout the Nation and the world at that time. After the late 1960s, the Navy and the remainder of the Federal Government paralleled the statutory requirements of the Occupational Safety and Health Act – and in many instances the Navy had more strict requirements which had to be met by the "operational Navy".

95. Throughout the time periods discussed herein – but especially for all occupational exposures after the enactment of the Occupational Safety and Health Act of 1970 – the employer and controller of the workplace was required to have an effective program for the control of exposure to regulated asbestos-containing materials. It was the employer and the employee – not the equipment manufacturer, that were responsible for safety and health in the workplace. For realistic delivery of OSHA–mandated workplace occupational safety and health programs at industrial facilities, all levels of management and supervision were involved. The Navy not only closely followed this mandate, it stood as a model for control of exposure and modification of the workplace. The Navy's "first-level supervisors" were the Chiefs and senior Petty Officers, and they were extremely important in monitoring the day-to-day adherence to mandatory safety and health regulations – while accomplishing the Navy's essential mission in National defense. The control of occupational exposure to asbestos was one of the five national "Target Health Hazards" established by OSHA in 1972. It was the Navy's "Number One" occupational safety and health program – starting in early 1971 with a redoubling of prior efforts. Environmental controls dealing with the content, labeling, handling, and disposal of asbestos-containing materials were also established under the Environmental Protection Agency (USEPA, 1973, 1975, 1976). The operational Navy also followed these requirements.

96. The presence and content of asbestos in various materials, including thermal insulation, gaskets, packings, and other materials used in naval, marine,

and industrial applications, were variable, but generally decreasing over the period of the 1950s through the 1970s. Additionally, the friability of these materials varied considerably. Unless a material is qualitatively and quantitatively analyzed in a scientific manner, the presence, type, and concentration of asbestos cannot be determined in either the material or in the air. The release of friable asbestos fibers into the air can only be determined through sampling and analysis of air samples. The mere "observation" that one can see a large particle of dust does not confirm that respirable-size asbestos fibers of any significant concentration would be inhaled. Visible dust is not necessarily "respirable" dust – and "respirable" dust is not necessarily all asbestos. Duration and frequency of exposures are also important in assessing asbestos exposure. From the industrial hygiene standpoint of controlling potential hazardous inhalation exposure to asbestos, it may be assumed that much of the thermal insulation and other materials, such as gaskets and packings, used in the construction and maintenance of naval vessels, as well as industrial facilities, contained asbestos during the era of the 1940s through the mid-1970s – and later; however, only proper analysis and determination by trained and qualified individuals are scientifically conclusive. Without such evaluation, it cannot be known whether, and to what extent, the products and the "dust", purportedly identified by individuals not trained and not utilizing applicable industrial hygiene methods, actually contained asbestos.

97. Based upon my decades of experience as an industrial hygienist and physician in the Navy, as well as the available scientific and medical literature and

known incidence of former Navy personnel with asbestos-related diseases, it can be stated with some certainty that personnel working in Naval and private shipyards and onboard Navy ships during the 1940s through the 1960s, and sometimes even into the 1970s, experienced what is today understood to be clinically meaningful exposures to asbestos dust – from both the general background level onboard a Navy vessel of the era, as well as when performing tasks on thermally-insulated surfaces. During this time period, the scientific and medical data indicated that controlling inhalation of asbestos fibers to levels below those which caused asbestosis effectively guarded personnel from the subsequent development of asbestos-related cancers. Typical shipboard exposure levels of this era were not considered to be excessive or causally involved with the development of asbestos-related lung disease by the contemporary occupational health professionals. The largest, and most significant, source of friable asbestos fibers from thermally-insulated surfaces onboard ships of those periods would be the pipecovering on the thousands of feet – literally miles – of piping. It is practically impossible to make any other definitive statement regarding the specific source(s) of a particular individual's significant exposures to respirable asbestos fibers onboard ship. More importantly, using the ungrounded and unsubstantiated assumption that each and every fiber contributes to the development of a cancer and actually causes the cancer is – from a scientific standpoint – meritless. The probabilistic "cause" in the development of a cancer, such as malignant mesothelioma, is based upon the source(s) that meaningfully contribute to an individual's effective "dose" – the dose is the amount which contributes to the risk that the "causal fiber" will reach the target cell and cause uncontrolled or unabated cellular changes which actually lead to the cancer. In retrospect, it must be realized that there were an extremely huge number of these individual asbestos fibers in the air using the scientifically-based, recommended exposure values developed and accepted by the scientific and medical communities, and used by the Navy and numerous other federal agencies and states during these various periods. The initial occupational exposure level of 5 MPPCF (30f/cc) equates to 1,059,300,000 asbestos fibers in each cubic meter of inhaled air (5 MPPCF x 6f/MPPCF x 35.31 cu ft/cu m); this equates to over 8 billion fibers inhaled daily (x 8 cu m/day max inhaled) by an individual before the enactment of the Occupational Safety and Health Act in 1970. The currently mandated OSHA Permissible Exposure Level of 0.1 f/cc (greater than 5 microns in length) for asbestos has been in effect since 1994. Under this PEL, there can still be up to 100,000 such sized fibers in each cubic meter inhaled, and up to 800,000 fibers can inhaled each day. Identifying the likely source of the causal fiber was, and remains, difficult and practically impossible. Also, it must be noted that not every asbestos fiber in an asbestos-containing material is released (friable) or inhaled (breathed in). Furthermore, not every fiber which is inhaled is "respirable" (brought into the lungs) and retained in the body, and finally reaches the site where the tumor develops. If each and every asbestos fiber contributed to the development of malignant mesothelioma, then one would expect the presence of many individual tumors arising from the enormous number of inhaled fibers. Generally, in the vast majority of cases, to the extent there exists any identifiable source of significant exposure to respirable airborne asbestos fibers onboard any ship of an era, including the general ship-wide background levels, the external thermal insulation on the piping would be that source – and by far the largest amount of friable asbestos material used onboard ships of the corresponding era.

98. Federal Department s and Agencies, such as the Navy, Coast Guard, Public Health Service, and Labor, had total control over its hazard communication program at all times relevant to this discussion, including control over the content – and methods of delivery – of safety instructions and warning provided to personnel. The Government exercised its discretion in this respect by balancing the priorities of operational necessity, the health and safety of personnel, as well as other practical and logistical considerations. The Navy, in particular, itself implemented a state-of-the-art occupational safety and health safety program that included asbestos. It thus chose to provide consistent, uniform instruction to sailors and shipyard workers, rather than delegating the task to a myriad of vendors with incomplete information, no control of the workplace, little knowledge of mission requirements, and who were not subject matter experts on asbestos hazards. It is unreasonable to conclude that the Navy would have appreciated or accepted gratuitous advice from equipment manufacturers about hazards associated with products (like insulation) that they did not manufacture, and about which the Navy was already well aware. Finally, in light of all the evidence regarding the Government's existing knowledge and robust program to prevent ex-

posures, and other Federal and state regulations requiring the protection and education of employees, it is impossible to imagine how a mere warning on a piece of metal equipment or product could possibly have meaningfully affected personal actions, and precluded exposures to airborne asbestos fibers, years and often decades, after the product was sold.

99. My scientific and medical opinions stated herein are based upon my education and training as a scientist and as a physician; my personal and professional experiences as a certified industrial hygienist and a board-certified occupational medicine physician; my operational and industrial experiences from my total Navy career; my research and review of historical documents regarding the Navy's knowledge as well as the scientific and medical communities' knowledge of the hazards of asbestos; and my communications with industrial hygienists and physicians who worked for the Navy and Public Health Service dating back to the early 1940s. These opinions are all stated within a reasonable degree of scientific, medical, and professional certainty.

s/ Lawrence Stilwell Betts, MD, PhD 12/[illegble]/2013
Lawrence Stilwell Betts, MD, PhD Date

DECLARATION OF JOSELYN C. SENTER, CIH

l. I, Joselyn (Josh) C. Senter, CIH, declare that I retired from the United States Navy at the rank of Captain in 2004, and now work as a Senior Industrial Hygiene Consultant with Aurora Industrial Hygiene, Inc., based in San Diego and Los Angeles, California. As reflected in my Curriculum Vitae (Attachment l), I have served as President of the Navy Industrial Hygiene Association and as a board member for the selection of naval officers eligible for promotion and command. My professional associations include the American Board of Industrial Hygiene, the American Industrial Hygiene Association, and the American Conference of Governmental Industrial Hygienists. I am board certified in the comprehensive practice of Industrial Hygiene by the American Board of Industrial Hygiene. I have been awarded the Navy Commendation medal, Vietnam Service and Vietnam Campaign medals, and was qualified as a Surface Warfare Officer while serving a!: an Unrestricted Line Officer.

2. During my Navy career, I was assigned to billets with professional duties and increasing responsibilities, initially as an officer of the Line, where I served aboard US Naval ships of war, and later as a scientist in industrial hygiene. As an Unrestricted Line Officer, I qualified as an Officer-of-the-Deck during sea operations, and was a Division Officer responsible for 20–30 enlisted personnel. As a Medical Service Corps Officer (Staff), I served as department head for industrial hygiene services at various Naval Medical Centers, as an industrial hygiene over-sight officer with the Navy Medical Inspector General, and as Senior Officer with the Chemical, Biological, Radiological

and Environmental Team at the Navy Environmental and Preventive Medicine Unit No. 5, San Diego, CA. Based upon my scientific training, my experience as a Line Officer working aboard US Naval ships, and the experience gained as a Navy officer for three decades, I am generally familiar with the industrial products that were used by the Navy and the Navy work environments, both ashore and afloat. Based upon my review of materials such as those referenced in Attachment 2, I am also familiar with the history and practice of the Navy occupational health program from its early days before World War II until the present time. I have also reviewed case specific materials and documents related to the John B. DeVries case, which is contained in Attachment 3.

3. In addressing the following issues, I have based my opinions contained in this report on my professional knowledge arising from my training, education, and experience as a scientist, and now retired, senior United States Navy officer. Additionally, my experiences from serving aboard deployed Navy vessels, an understanding of the chain of command and channels of communication, and knowledge of the decision making process at the deck plate, as it relates to asbestos and other occupational health hazards within the Navy, helped me with my findings and conclusions.

4. The issues addressed are:

   A. What was the Navy's historical IH and safety program from inception to the 1970s?

      1. How did it compare to state of the art or knowledge of others?

      2. In particular, what did the Navy know about the hazards of asbestos?

3. What were the relative shipboard asbestos exposures with which the Navy had to deal in its mandate of defending the country?

B. Was there anything about asbestos available at the time that an equipment manufacturer could have told the Navy that would have both enhanced its knowledge and made a difference in its use and handling of asbestos?

   l. Even if the Navy would have permitted an equipment manufacturer to communicate such information about the hazards of asbestos to sailors if it differed from what the Navy was telling them, would it have changed the manner in which a sailor performed his job?

HISTORY OF KNOWLEDGE AND CONTROL OF ASBESTOS HEALTH HAZARDS BY THE US NAVY

5. The use of asbestos onboard naval vessels was born out of military necessity. Though many of the hazards associated with asbestos were known during the early 1920s, it appears fairly certain that its critical properties, which made asbestos a logical choice in fulfilling the Navy's need for light weight insulation material, were a driving consideration for its use. The versatile utility of the material was paramount for ship building, and, as discussed in their landmark paper addressing the use of asbestos in the Navy, LCDR W.R. Fleischer and coworkers (1946) write:

> "***....The chief reasons for the wide use of amosite felt and pipe covering in naval work are its low thermal conductivity, light weight, strength and refractoriness.***

When the felt and pipe covering were first developed, we were still building vessels under the Washington Treaty of Limitations in Tonnage, and every pound saved meant that much more armor, guns or ammunition for a given displacement, to say nothing of more economic operation for the weight involved in insulation.

Amosite pipe covering weighs about 14 pounds per cubic foot, with a weight of 16 pounds per cubic foot, and a temperature limit of 500 F, High temperature amosite pipe covering weighs about 18 pounds per cubic foot as compared to 26 pounds per cubic foot for other high temperature insulations. Because of the lower conductivity and the higher temperature limit of the amosite type, less of it need be used in combination covering than other types of insulations."

6. As previously noted, the United States Navy recognized that the inhalation of asbestos fibers in sufficient amounts (dose concentration x time) could result in pulmonary disease as early as the 1920s. In the "Instructions to Medical Officers (Notes on Preventive Medicine for Medical Officers, United States Navy" (Dublin, 1922)), asbestos was listed as one of the many inorganic and organic dusts that could cause pulmonary disease. Though Industrial Hygiene Officers were not yet a part of the Navy's Medical Department, Medical Officer's were urged to established an active program to identify hazardous exposures, and when

circumstances warranted, to advise responsible managers in the shipyards on methods to control any perceived exposures which might cause health effects.

7. Dublin recognized several methods to prevent the inhalation of these dusts (asbestos) including:

a. the use of water to control the release of dust;
b. the use of local exhaust systems to remove the dust at the point of origin;
c. the use of inclosing (sic) chambers; and
d. the use of respirators and helmets.

He stated: "***No one of these can apply to all conditions, but the particular method to be used must be adapted to the peculiarities of the process***." Based on his recognition of the complexities of control, there is sufficient reason for me to conclude that his attentions were turned towards the control of dust which might have some deleterious effect on the worker, and not the control of dust for its nuisance properties.

8. In 1941, during the 5^{th} Annual Meeting of Members of the Air Hygiene Foundation of America, Captain Ernest W. Brown, Medical Corps, USN, highlighted the importance of industrial hygiene to the Navy and national defense. Recognizing the potential for "***new problems in industrial hygiene***" as naval construction increased, CAPT Brown acknowledged that the Senior Medical Officer of a major Navy Yard might benefit from the establishment of a separate unit to deal with the problems arising with the growing industrial force. Prior to this view, the United States Navy had expanded the scope of its asbestos hazard control program by including the enlisted corpsmen of the medical department in the hazard

control process. In the "Handbook of the Hospital Corps" (United States Navy, 1939), the Bureau of Medicine and Surgery discussed the organization used for disease and injury prevention in the United States Navy, and took a lead position in the prevention of industrial diseases:

> "***The government having passed such laws must therefore lead the way in protecting its own employees.... An organization has been set up in the Navy to protect its personnel, both civilian and naval, a safety engineer is provided who acts directly under the Assistant Secretary of the Navy. He has supervision of the safety precautions taken to protect the civilian employees in the navy yards, ammunition depots, torpedo stations, and the like. He is also a consultant in all matters pertaining to safely aboard ships, al training stations and other Navy Department activities. A naval medical officer is assigned to his office for the purpose of consultation in all matters pertaining to health and safety and to cooperate in devising means by which health may be protected and accidents prevented. Aside from this particular medical officer, all medical officers, dental officers, members of the Hospital Corps and nurses form the balance of the medical staff of this organization. It is essential that each of these members know and understand the hazards to the encountered in the Navy, the steps to be***

taken to protect against injury and disease, the treatment of diseases and injuries arising there from and the organization of medical personnel for such purposes. Naval medical personnel are required to perform duties ashore, at sea, in foreign countries, in the air and under the sea. In each of these places a variety of health hazards exist. It is therefore necessary that these personnel have a thorough knowledge of the industry to which they are attached, the hazards presented, the methods of prevention and the treatment of all injuries occurring.

In all navy yards, the Commandant is the head of the organization. He is responsible to the Navy Department for the protection of the employees, as well as the naval personnel, under his command. He is familiar with the nature of the work being performed by the employees at his station and on the health and accident hazards presented. Accordingly, he appoints, as the working head of the organization, a safety officer or a safety engineer, as he is better known. The safety engineer must be of sufficient rank to have become familiar with the various trades in a navy yard, a knowledge of machinery, a man of cooperative ability and well liked, and having sufficient knowledge of safety devices and appliances to intelligently make inspections and recommend proper protective

***measures. His duties are primarily, to prevent accidents and promote healthy working conditions. It is his duty to inspect all working places, make a general survey of all mechanical conditions and to recommend the addition of all necessary safety appliances for the protection of the workers*".**

9. Interestingly, there was an early awareness that the Safety engineer might benefit from the expertise medical personnel brought to the evaluation of the industrial environments:

"***The Commandant further assigns a medical officer to act as advisor to the safety engineer. The medical officer must be of the same qualifications as the safety engineer, with the addition that he must be thoroughly versed in the diseases connected with Industry… It is well for members of the Hospital Corps to understand the nature of these duties in order that they may be of assistance to him in the performance of these duties: … He acts as consultant to the safety engineer in all matters pertaining to the general welfare and health of the employees. Hygiene and sanitation are his important duties. He must interest himself in the employees and instruct them in the everyday principles of personal hygiene and self preservation. He must instruct the employees in safety measures and encourage them to cooperate in protective measures. They must be made "safety conscious" or "safety***

minded". The morale must be kept up.... The medical officer must inspect all working places in order to have a better understanding as to the actual conditions under which the men work. He must make appropriate recommendations to improve deficiencies noted and must then see that these recommendations are carried out.

The safety engineer is assisted in his work by the foremen of the shops and in some instances by safety committees in each shop elected by the employees. These men or committees are generally chosen from among the older employees and from men who have considerable experience in their trade... The organization of the medical advisor is composed of junior medical officers, dental officers, to some extent, members of the Hospital Corps, and of nurses. The duties of the hospital corpsmen are to assist the medical officer in his inspections, assist in the treatment of the injured and to prepare the necessary reports and returns in cases of accident, occupational disease, and the physical examination of employees."

The hospital corpsman was specifically instructed to help keep the workforce healthy:

"***Proper working places must be provided and maintained. Hygienic and sanitary conditions must be kept on a high plane. All moving parts of machinery must be guarded, goggles provided for workers required to use them; helmets and masks for***

> ***sand blasters; proper ventilation for the chrome workers; masks for asbestos workers; protection for workers in x-ray and radium; protective gloves, shoes, and other garments for foundry workers, and other means of protection too numerous to mention here must be available and used. Special physical examinations must be made of all sand blasters, asbestos handlers, those exposed to radium and its compounds, lead workers, those engaged in dusty or smoky trades, handlers of T.N.T. and other explosives, etc., to prevent the occurrence of the diseases associated with those trades from injuring the men.***"

10. The Navy's approach to the recognition and control of health hazards in the work environment, through its use of medical advisors to the safety engineering department, illustrates how a different design of assessment of the workplace evolved as new materials were introduced into the Navy Yards. The practice of wetting down insulating material, using gloves and respirators in dusty environments, was prominently noted in the "Annual Report of the Surgeon General, US Navy to the Secretary of the Navy" by Captain EW Brown, MC, USN (1941).

11. When quantitative assessment (counting) of asbestos particles in air was available, the Navy followed the recommendations of the United States Public Health Service. Based upon the findings of W. C. Dreessen and coworkers' (1938) study of asbestosis in the textile industry prepared by direction of the United States Surgeon General, the United States Navy accepted an exposure level of 5 million particles

per cubic foot (5 MPPCF) as the time-weighted average (TWA) for occupational exposure. Dreessen *et al.* concluded:

> "***It would seem that if the dust concentration in asbestos factories was kept below 5 million particles (the engineering section of this report has shown how this may be accomplished), new cases of asbestosis would probably not appear.***"

Note: The American Conference of Governmental Industrial Hygienists (ACGIH) has defined the TWA as the "***concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect.***"

12. The Navy's occupational health program was based upon internal support for the identification and control of occupational health hazards. In order to develop a sufficient cadre of physicians and scientists, the Navy developed training programs with Columbia University's DeLamar Institute of Public Health and the Harvard School of Public Health. By the end of World War II, over one hundred physicians, scientists, and engineers had been trained in occupational health at these two leading institutions of US public health.

13. In addressing exposure to asbestos, Philip Drinker, then Chief Health Consultant for the United States Maritime Commission, and Professor in the Harvard School of Public Health program that was training the Navy physicians, scientists, and engineers, recommended an occupational exposure level of 5 MPPCF,

(Drinker, 1944). This is the same value as recommended by Dreessen and coworkers (1938) to prevent the development of disease.

14. "Minimum Requirements for Safety and Health in Contract Shipyards" were drafted in 1942, and approved by the US Navy and the US Maritime Commission in early 1943. At the time, the criteria set were considered the foremost health and safety standards established. At a minimum, the commission mandated:

> "***Each contractor is hereby given notice that the Navy Department and the Maritime Commission will expect full and complete compliance with the minimum standards which bear the approval of the Navy Department and Maritime Commission, and each is requested to give full cooperation to the consultants on health and safety who will be charged with the coordination and supervision of the safety and health program of the two agencies.***"

15. Within a few months following the implementation of the Minimum Requirements, the Secretary of the Navy (Forrestal, 1943) reaffirmed these requirements for all private shipyards having Navy contracts. The aim of this initiative established baseline standards from which safety guidelines could be discussed and implemented at all shipyard facilities. An inspection team, comprised of safety and health inspectors, would make visits and document discrepancies in worksite operations. Those discrepancies considered significant were first discussed with the shipyard management, thus allowing management the opportunity to take corrective action for imminent dangers.

The actual written report was submitted in draft form to the regional director of the Maritime Commission for final typing and distribution.

16. The Navy continued to use 5 MPPCF as a reasonable value for asbestos exposure as a maximum allowable concentration. This had been the recommended value by the National Conference of Governmental Industrial Hygienists in 1942, and later adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) in 1946. Among the members of the ACGIH in 1946, "*a private, not-for-profit, nongovernmental corporation whose members are industrial hygienists or other occupational health and safety professionals dedicated to promoting health and safety within the workplace*", were three representatives of the Navy Department and forty-two representatives from the United States Public Health Service. The use of the 5 MPPCF level as the occupational exposure value continued to be generally accepted by professionals practicing occupational health in the United States. This occupational exposure value, and the widespread use of asbestos, continued in the Navy until the late 1960s when the scientific and medical communities (Selikoff 1965, 1967) and the United States Navy (Commander NAVSEC, 1969; Officer-in-Charge NAVSEC Phila, 1969) had evidence that it was not sufficient to adequately control the health effects of exposure.

17. The Navy used the occupational exposure level that the best scientific and medical evidence supported. In 1955, the Navy adopted the "Threshold limit values for toxic materials" developed by the American Conference of Governmental Industrial Hy-

gienists as a basic reference and "***to provide guidance toward the reduction of potential health hazards encountered in the industrial environment for both military and naval civilian personnel.***" The Navy (BUMED, 1955) recognized that:

> "***[The] threshold limit values should be used as a guide in the control of health hazards and should not be regarded as fine lines between safe and dangerous combinations. The most desirable levels in all cases are those approaching zero, but practical considerations frequently require the acceptance of higher levels which are safe, but not ideal.***"

Moreover, the Navy recognized that:

> "***[The] threshold limit values ... are based on the best available toxicological information, long-term industrial experience, and experimental studies. In as much as these values are constantly being reevaluated, revisions or additional will be made as further information becomes available.***"

18. On January 7, 1958, the Department of the Navy issued its "Safety Handbook for Pipefitters". This handbook was one of many safety handbooks issued by the Navy as an aid in safety indoctrination and accident prevention. That handbook provides, in part:

> "***<u>Asbestos</u>. Asbestos dust is injurious if inhaled. Wear an approved dust respirator for protection against this hazard.***"

19. During the 1960s, the Navy continued to promulgate procedures and emphasized the hazards of asbes-

tos in publications for both Navy and civilian employees. For example, in the October 1962 issue of its *Safety Review* journal, published an article published by Capt. H.M. Robbins, M.C., and W.T. Marr, industrial hygienist, entitled "Asbestosis." This article stated:

> "***The worker's best protection is to avoid careless creation of dusty conditions, use damp material when possible, and wear respiratory protection constantly. There is, at present, no known cure for asbestosis. Once a person has contracted the disease he has suffered a loss of health which cannot be redeemed.***"

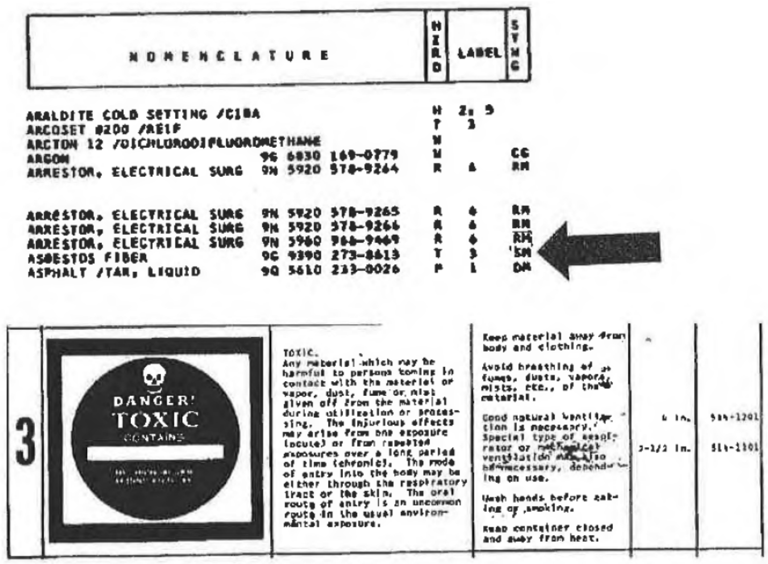
On the civilian side, the Navy's April 1965 publication *Safety Precautions for Shore Activities*, issued by the Office of Civilian Manpower Management, which purpose was" to alert safety and supervisory personnel to the hazards involved in the use of certain materials and provide the necessary precautionary measures" re-enforced BUMED's, adherence to the TLVs, and specifically stated:

> "***2058. MINERAL DUSTS***
>
> ***Certain mineral dusts are pneumoconiosis (a pathological lung condition produced by mineral or metallic dust inhalation producing. The most prevalent and insidious forms are silicosis and asbestosis caused by prolonged inhalation of dusts (or mists) containing silica or asbestosis.***
>
> ***2. Asbestosis. The effects of asbestosis are similar to and just as disabling as those of silicosis. There is evidence, however, that***

the handling of asbestos products in the Navy are not so well controlled, if the prevalence of asbestosis is any indication. Exposure to asbestos dust is usually encountered in the installation, repair and removal of insulating pipe covering principally used aboard ship. The following precautions should be taken in any dust making operations involving asbestos products:

> ***a. Provide permanent general ventilation in areas where dust producing operations are usually performed.***
>
> ***b. Install exhaust hoods over saws and other dust making machine tools.***
>
> ***c. Require workers to wear dust respirators where dusty operations cannot be adequately ventilated.***
>
> ***d. Use industrial vacuum cleaners in lieu of dry sweeping of floors and other surfaces.***"

20. In its 1969 Consolidated Hazardous Items List, the Navy specifically identified asbestos as a toxic substance requiring a Level 3 hazard label which is setout below:



NOMENCLATURE			HZRD	LABEL	SYMG
ARALDITE COLD SETTING /CIBA			H	2, 5	
ARCOSET #200 /REIF			T	3	
ARCTON 12 /DICHLORODIFLUOROMETHANE			N		
ARGON	9G 6830	169-0779	N		CG
ARRESTOR, ELECTRICAL SURG	9N 5920	578-9264	R	6	RM
ARRESTOR, ELECTRICAL SURG	9N 5920	578-9265	R	6	RM
ARRESTOR, ELECTRICAL SURG	9N 5920	578-9266	R	6	RM
ARRESTOR, ELECTRICAL SURG	9N 5960	966-9469	R	6	RM
ASBESTOS FIBER	9G 9390	273-8613	T	3	SM
ASPHALT /TAR, LIQUID	9Q 5610	233-0026	P	1	DM

3	DANGER! TOXIC CONTAINS	TOXIC. Any material which may be harmful to persons coming in contact with the material or vapor, dust, fume or mist given off from the material during utilization or processing. The injurious effects may arise from one exposure (acute) or from repeated exposures over a long period of time (chronic). The mode of entry into the body may be either through the respiratory tract or the skin. The oral route of entry is an uncommon route in the usual environmental exposure.	Keep material away from body and clothing. Avoid breathing of fumes, dusts, vapors, mists, etc., of the material. Good natural ventilation is necessary. Special type of respirator or mechanical ventilation may also be necessary, depending on use. Wash hands before eating or smoking. Keep container closed and away from heat.	6 in. / 3-1/2 in.	5[illegible]-1201 / 51[illegible]-1101

Similarly, several asbestos-containing adhesives were also classified as Level 3 toxic hazards in the 1969 CHIL list.

21. Selikoff, in a paper written with Lee in 1979 (Lee, 1979), wrote:

> ***"What's past is prologue!" The decade of the 1960s provides a convenient time at which to terminate a historical view of asbestos disease. With admirable hindsight from the late 1970s we can see that the essential evidence had already been reported, but not yet assembled or vested with sufficient credibility to be entirely convincing. With few exceptions, the evidence at that time rested on scattered reports of small numbers of cases, and the cases themselves suffered from being either selected or simply those that hap-***

pened to come to the attention of the reporter. The population base from which the cases came was seldom mentioned. The significance of pleural changes and the occurrence of mesothelioma in persons without a distinct history of exposure remained in considerable doubt. The idea that asbestos could be at least a cofactor in the production of bronchogenic carcinoma was far from fully accepted. That parenchymal asbestosis was very likely to occur in those who had been exposed to heavy dosage in the early years of the industry was clear enough, but what effect environmental controls that had been introduced in the late 1930s might have upon its future prevalence was unknown. The possibility that quite low dosages might have grave consequences 30 or more years after first exposure was still unproven.

Many things were needed to confirm the suggestions that were emerging from the studies up to that time. Most importantly, systematic epidemiologic investigation was needed of large cohorts drawn from various types of industry, with the inclusion of adequate control populations. Some of these were already organized, but it was too early for the results to be meaningful. We now know that much of the negative evidence stemmed from coming to conclusions prematurely, before the slow processes of carcinogenesis had had a

> ***chance to make themselves evident. We now know also that reduction of heavy exposures that lead to early death would reveal such slowly developing diseases as mesothelioma and bronchogenic carcinoma with increasing clarity. But foreknowledge was not available at the time, although some investigators suspected that the auguries were not good. More sophisticated and sensitive ways of recognizing the disease processes at an early stage, before the appearance of marked radiographic changes, were badly needed. A series of international conferences, some already in the planning stages, were to accelerate these developments greatly. Those who felt that it was an exciting time were not to be disappointed. The excitement has not even yet been entirely dissipated."***

22. It was not until 1970, that statutory "permissible exposure limits (PELs)" were nationally established under the Occupational Safety and Health Act (PL 91-596). The PELs were based upon the occupational exposure levels published as the 1968 ACGIH threshold limit values (TLVs). These national standards applied to shipyards, as well as other industries using asbestos. At the time of enactment in 1971, the PEL for asbestos was initially 12 fibers per cubic centimeter (f/cc). However, based upon the evolving and current scientific and medical recommendations by the time of enactment, the Occupational Safety and Health Administration (OSHA) emergently lowered the PEL to 5 f/cc (ceiling value of 10 f/cc) in late 1971,

with a permanent standard of 2 f/cc becoming effective in 1976. In 1975, OSHA recognized sufficient medical and scientific evidence of human carcinogenicity to recommend the reduction of the permissible exposure limit to 0.2 f/cc. After legal challenges, OSHA reduced the PEL to 0.2 f/cc in 1986, and further reduced it to its current value of 0.1 f/cc in 1994. Requirements from the highest levels of authority in the United States Navy established the permissible occupational exposure levels and control methods as they changed during this post-OSHA era (DoN, 1971; BUMED, 1973; OPNAV, 1974.)

23. I believe that the existing archives of papers, instructions and manuals demonstrate the concern of Navy personnel with the health threat potential of asbestos in the workplace. From its early introduction, to its growing usage, it is my professional opinion and experience as an Industrial Hygienist that the Navy was not only aware of the health hazards associated with the use of asbestos, but encouraged and nurtured an expertise in the safety and management of its use as early as the 1920s. Merging an occupational health concern with a vigilant safety engineering program, the Navy ushered in a new model of addressing environmental and occupational exposures brought about with the use of asbestos. It was the Navy's position to establish state-of-the-art science as a means to limiting the health hazards from material deemed "necessary" to its mission. And, in developing this approach, a responsive climate of advancing the knowledge and science of controlling the release of asbestos fibers became a hallmark to its characterization of hazards in the work environment.

WAS THERE ANYTHING ABOUT ASBESTOS AVAILABLE AT THE TIME THAT AN EQUIPMENT MANUFACTURER COULD HAVE TOLD THE NAVY THAT WOULD HAVE BOTH ENHANCED ITS KNOWLEDGE AND MADE A DIFFERENCE IN ITS USE AND HANDLING OF ASBESTOS?

24. Captain NE Rosenwinkel, MC, USN, representing the Navy's Surgeon General and the Bureau of Medicine and Surgery, provided information regarding the Navy's knowledge of asbestos hazards to shipyard employees for inclusion in a statement issued by Rear Admiral JJ Stilwell, USN, of the Shipyard Management Directorate, Naval Sea Systems Command in 1968 (Rosenwinkel, 1968):

> "***The United States Navy is well aware of the hazards of asbestos to its employees engaged in ship construction and ship repair at naval shipyards. Hazard control measures implemented by the shipyard medical departments and safety divisions are in accordance with accepted standards of industrial hygiene practices in the United States. Stringent efforts are directed at keeping the concentration of airborne asbestos dust below the level recommended by the American Conference of Governmental Industrial Hygienists. An energetic periodic physical examination program insures the health of personnel exposed to this hazard.***"

25. The technical and scientific knowledge possessed by the US Navy, with respect to the specification and utility of asbestos, and the potential health hazards

associated with its use onboard US Navy vessels, was deemed state-of-the-art. Precautions taken by the Navy to insure asbestos exposures were minimized predates much of the scientific and medical proof that asbestos could cause lung fibrosis by Cooke in 1924, and the use of the term "asbestosis" by Sir Thomas Oliver in 1925. The potential for this inorganic dust to cause harm was recognized by Dublin in his "Notes on Preventive Medicine for Medical Officers, United States Navy" in 1922. In this document, Dr. Dublin addresses asbestos exposure as one of the "OCCUPATIONAL HAZARDS AND DIAGNOSTIC SIGNS: A GUIDE TO IMPAIRMENTS TO BE LOOKED FOR IN HAZARDOUS OCCUPATIONS."

26. The health hazards associated with asbestos had been addressed by the Navy in its occupational health and safety programs pre-dating World War II. The knowledge of the hazards created by the use of asbestos containing materials was weighed with respect to the vital benefits provided. The Navy sought to control asbestos exposures consistent with developing scientific and medical knowledge, and, as such, balanced its potential for harm against the needs for national defense.

27. The Navy's asbestos control program, multifaceted and complex, included hazardous process identification, engineering controls, use of alternative materials in accordance with Navy specifications, personal protective equipment, training and education, and medical surveillance. The emphasis on each of these elements was dictated by the level of exposure to airborne asbestos fibers.

28. In 1978, testimony provided by the Navy at a Congressional subcommittee noted the following:

> "***In addition to thermal insulation, other shipboard asbestos applications include those products which can be found in general use by industry and in homes and office buildings. Floor tiles, various gaskets and valve stem packings and galley range insulation are just a few examples. However, this asbestos is in a bonded or contained form and routine careful handling would preclude emissions of potentially hazardous levels of airborne fibers.*" *Captain JC McArthur, USN (1978)***

29. Gaskets and packing materials were classified as a minimal hazard. Because of its characteristics, respirable asbestos fibers were unlikely to be generated into the atmosphere during prescribed applications. (Lawrence Liukonen et al, 1978). Many Navy and other published studies have confirmed that the greatest potential for exposure to airborne asbestos fibers aboard ship comes from the uncontrolled application and removal of thermal insulation, not the handling of gaskets and packings (Robbins and Marr, 1962; Marr, 1964; Liukonen et al, 1978; Mangold et al, 1978; Williams et al, 2007; Hollins et al, 2009).

EVEN IF THE NAVY WOULD HAVE PERMITTED AN EQUIPMENT MANUFACTURER TO COMMUNICATE SUCH INFORMATION ABOUT THE HAZARDS OF ASBESTOS TO SAILORS IF IT DIFFERED FROM WHAT THE NAVY WAS TELLING THEM, WOULD IT HAVE CHANGED THE MANNER IN WHICH A SAILOR PERFORMED HIS JOB?

30. The Navy plays a vital role in maintaining our national security. As such, the complexities that comes

with managing a massive organization dictates a uniformity of action and understanding throughout. More so than a civilian work environment, a consistent doctrine of communication and leadership is critical to the well being and safety of everyone who serves in the uniform services. Thus, as stated in "***The Bluejackets' Manual***" (United States Naval Institute):

"**The chain of command exists to ensure that:**

1. **The Navy and its sailors do their jobs without confusion and without wasting time and effort.**
2. **Those in charge know what their responsibilities are.**
3. **Everyone is accountable to someone for his or her job and actions.**
4. **There is a sense of direction, so that everyone knows what they're supposed to do.**
5. **Clear communication exists, both up and down, so there will be no doubt where you or anyone else stands in the chain of command.**"

31. As a matter of guidance and control, Department of Defense Form 1966 (DD1966), *Enlistment/Reenlistment Document - Armed Forces of the United States*, Section C, illustrates the distinctiveness of the military (Navy) culture a member is expected to live within as a result of his/her enlistment. A member of the Armed Forces agrees that:

"*......Many laws, regulations, and military customs will govern my conduct and require me to do things a civilian does not have to do. The following statements are not promises or guarantees of any kind. They explain some of the present laws affecting the Armed Forces which I cannot change but which Congress can change at any time.*

a. My enlistment is more than an employment agreement. As a member of the Armed Forces of the United States, I will be:

(1) Required to obey all lawful orders and perform all assigned duties.

(2) Subject to separation during or at the end of my enlistment. If my behavior fails to meet acceptable military standards, I may be discharged and given a certificate for less than honorable service, which may hurt my future job opportunities and my claim for veteran's benefits.

(3) Subject to the military justice system, which means, among other things, that I may be tried by military courts-martial.

(4) Required upon order to serve in combat or other hazardous situations.

(5) Entitled to receive pay, allowances, and other benefits as provided by law and regulation.

> ***b. Laws and regulations that govern military personnel may change without notice to me. Such changes may affect my status, pay, allowances, benefits, and responsibility as a member of the Armed Forces REGARDLESS of the provisions of this enlistment/reenlistment document.***
>
> ***c. In the event of war, my enlistment in the Armed Forces continues until 6 months after the war ends, unless my enlistment is ended sooner by the President of the United States.***

32. In some regards, these parameters might appear overly harsh and restrictive. Yet, as with much of the guidance and control placed before service members, a well defined statement of expectations and consequences is essential to good order and discipline. Upon this foundation, standards of uniformity in communications is reflected in SECNAV Instruction 5100.8 — which is an internal directive from the Secretary of the Navy directing Navy personnel, not manufacturers of material or equipment, of the manner in which to carry out their obligations—Para.l states:

> "***The purpose of this Instruction is to standardize labeling requirements for hazardous chemical products during usage...***"

33. MILSPEC-M-15071D, Para. 3.3.1, makes it clear that equipment manufacturers' manuals must first be approved by the Bureau of Ships and the "manual shall not be modified without approval of the Bureau of Ships." Moreover, it cautions:

"***Notes, cautions, and warnings should be used to emphasize important critical instructions. The use should be as sparing as is consistent with real need.***"

It is because clear and concise communication is so important to the Navy's routine operation that it is highly improbable that unsolicited and gratuitous warnings regarding the use of materials made by commercial vendors would be allowed, especially if they were redundant and/or inconsistent with the Navy's existing communications in this regard. Any suggestion that a manufacturer was free to depart from Navy-approved manuals and instructions would not be consistent with the uniformed practice of the Navy.

34. With the increasing use of asbestos in World War II, the Navy expanded its occupational health programs for asbestos and other chemical, physical, and biologic agents which were consistent with the accepted state-of-the-art for each of these potential hazards at that time. Notably, these wartime programs were discussed by Captain Brown in 1941. Philip Drinker, as the United States Maritime Commission's Chief Health Consultant in 1945, wrote to the Navy's Bureau of Ships, recommending that 5 MPPCF be used as the industrial hygiene control level – even before that level was formally recommended by the American Conference of Governmental Industrial Hygienists in 1946. This is the same value that was used as the occupational exposure level in the noteworthy "Fleischer-Drinker study" published in 1946.

35. As previously noted, the Navy's knowledge regarding the applications of asbestos-containing products and their health effects represented the state-of-the-art. Through the occupational safety and health

program, and the dissemination of information through the chain of command, nearly all Navy sailors serving on WWII era ships, by and through the late 1960s, were alerted to the hazards of asbestos. Instructions, specifications and internal directives addressed the health hazards associated with asbestos so often that it was a standard assumption that all high temperature thermal insulation used on steam pipes contained asbestos. The exact type and composition of the thermal insulation may not have been known, but the use of asbestos for such application was so universal that identification of the insulation as asbestos-containing was often assumed – even in instances where it had been replaced with fibrous glass, mineral wool, or other non-asbestos materials. As a fundamental aspect of Navy training and practice, dust control and a high level of general cleanliness, even in the engineering spaces, were routinely maintained as part of the Navy shipboard environment. Thus, in my experience as a Line Officer, major repair operations on turbines and other engine room equipment was routinely deferred at sea for in-port periods, unless dictated by emergencies, where environmental controls could be effectively employed.

36. Mr. DeVries, through his testimony, made no reference to precautions or protective equipment worn by himself, his charge, or workers from the shipyards. As previously discussed, however, navy publications of various types described hazards, safe work practices, and the importance of Navy personnel utilizing personal protective equipment when working with asbestos. Shipyards, especially, during the Late 1950s and into the 1960s, were under heavy scrutiny to comply

with established procedures for handling asbestos insulation. Along with directives from the Type Commanders (NAVSEA, BUMED, NAVSHIPS, etc.), it has been clearly demonstrated that the Navy made every attempt to educate its civilian and military personnel on many levels. Along with this concerted effort to institute a comprehensive asbestos program, the Navy relied on its chain of command to execute all elements of the program prudently. Not providing personal protective equipment to personnel performing asbestos operations would represent a serious, and notable, failure to promote a safe and healthful environment. Such a failure to follow and execute a direct order from higher authority would potentially result in severe consequences for commanding officers and senior personnel. For Mr. DeVries, serving as a junior officer, and later as the Department Head of Engineering, to have not been aware of the hazards of asbestos seems implausible. Had he been present in the shipyard during insulation removal by civilian workers, if only for a brief period, he would have witnessed personnel employing respirators and other protective measures previously discussed. It would be reasonably expected for any newly commissioned officer to inquire as to the "whys" for the protective posture of workers working in his space of responsibility, and to have then been informed that it was required for asbestos work.

37. Historically, the Navy has relied upon officers to familiarize themselves with all directives impacting the safety and well being of personnel placed in their charge. To that end, the knowledge of safe practices was continually promulgated to junior and senior per-

sonnel alike. This method of communicating important information, unlike communications from vendors and manufacturers, insured consistency. Taking into account Mr. DeVries engineering degree at Cornell University, then later training at the Navy's Engineering School, to have been instructed in the need for, and the various types of insulations used within engineering spaces and not have been introduced to the potential dangers associated with working with asbestos seems unlikely.

38. The potential exposure of active duty Sailors to significant levels of asbestos fibers was only recognized under unusual conditions – such as periods in which ships were "in the yard" for overhaul or undergoing significant maintenance (Wynkoop, 1947). The fact that asbestos was used throughout naval vessels does not, in itself, extrapolate into continuous exposure to personnel assigned to that vessel. To give credence to this supposition, one would have to accept that every sailor, despite his rank, rate, and work station, was in jeopardy of "*significant exposure(s)*" to asbestos. A supposition disproven with industrial hygiene sampling results for non-asbestos operations aboard ships, and in shipyards (Robbins and Marr, 1962; Marr, 1964; Liukonen et al, 1978; Mangold et al, 1978; Williams et al, 2007; Hollins et al, 2009).

39. It is important to note that the assertions made by Captain R. Bruce Woodruff, USN (Ret), an expert for the plaintiff, that "*Without doubt or question, Mr. DeVries received significant exposure to asbestos during his more than 1000+ days assigned to the Turner.....*"does not localize the source of Mr. DeVries' exposure. It has been my experience, as a Navy Industrial Hygiene Officer, Medical Service Corps, that

air sampling procedures which allow for qualitative and quantitative analysis during microscopy examination, are necessary to support such claims. To that end, while CAPT Woodruff may have experience and knowledge regarding the potential installation of insulation on a naval ship, he does not indicate any formal training or expertise in air sampling analysis and strategies, comparable to those practiced by an Industrial Hygienist, to make the aforementioned type of determination with any reasonable degree of credibility or certainty.

40. The Navy's occupational health program not only addressed asbestos exposure, but it had a significant medical component which contributed to advancing the state-of-the-art knowledge. In 1955, Mr. JR Sheehan, an industrial hygienist at the Long Beach Naval Shipyard, wrote to Mr. Webster Ay, the Secretary of the Asbestos Union #20 at that Yard, to inform him of the availability of a new medical test being developed by Hurley Motley, MD (at the University of Southern California) to measure early pulmonary function changes and encouraged its acceptance and use among the Yard's asbestos workers, pipe coverers, and insulators. This type of test later became commonly used as it was more sensitive than chest radiography in detecting early lung changes from dust exposure. In addition to industrial hygiene engineering controls, the Navy also developed task specific training for individuals potentially exposed to levels of asbestos exceeding 5 MPPCF.

41. In the late-l950s, Mr. W.T. Marr (Bremerton Navy Shipyard) was investigating alternate sampling and measurement techniques for the evaluation of asbestos. He proposed that fiber length and concentration

was more indicative of injurious exposures to personnel than one which depended purely on particle counts. This was a departure from the methodology that was in general acceptance, and it changed the overall direction that the Navy would move, and later accept, as the standard maximum exposure for asbestos changed from 5 MPPCF to 2 fibers per cubic centimeter (2 f/cc).

42. This progressive approach to safeguarding the health and safety of Navy personnel was in keeping with the philosophy of those who were charged with the responsibility within the Navy in that:

> "***......there is no higher priority in peacetime operations than the safety and well-being of the ship and crew. Make clear to the crew that this is your highest priority, and that you expect it to be theirs as well.***" (The Naval Officer's Guide)

The flow of information, as it affects the crew, is always critical to good order and discipline.

> "***There are many customs unique to the naval service. The origin of some of these is obscure, but Navy members conscientiously observe them none the less.***" (The Naval Officer's Guide)

43. According to Mr. DeVries testimony, and his personnel records, he was assigned to the USS Turner for 3 years as of June 1957. As a surplus engineering officer, it is unclear when Mr. DeVries assumed the duties of the Engineering Department Head, but it is unlikely that as an Ensign he would have been placed in this position until he had attained sufficient experi-

ence and rank. According to his medical records, Ensign DeVries received his promotional physical, and was deemed physically qualified for temporary promotion to Lieutenant junior grade (LTJG), on 24 October 1958. This would suggest that as late as November 1958, Mr. Devries was probably still in a subordinate role in the Engineering department aboard the Turner.

44. Mr. DeVries also testified that the Turner completed 2 Mediterranean cruises (usually 6 months in duration, with 8–10 months of down time and local operations), and 2 yard periods (averaging approximately 10–12 weeks) during his time onboard. If Mr. DeVries' only "significant exposure" to asbestos occurred during his time in the Navy, based on my experience as a line officer, any potential exposure to asbestos from the ship's turbines, in comparison to the numerous equipment issues, failures and maintenance he faced throughout the engineering spaces and other areas of the ship, would be relatively miniscule with such a full operational schedule.

45. Further, from my experiences as a junior officer aboard a naval ship at sea, standing watches on the bridge, while in a 4-section watch schedule, often took precedence over many of your other duties. Mr. DeVries would have had to rely on senior enlisted personnel in his engine room spaces to supervise junior personnel and conduct many of the day to day tasks. As a junior officer, during his first assignment, his principle responsibility would be to learn how to drive the ship. I believe Mr. DeVries overlooks how much his reliance on his senior enlisted personnel may have been, and fails to recall how much his initial time onboard was spent being a division officer, responsible

for passing the word from officers more senior to him. A responsibility considered vital in grooming young officers for roles in management.

46. Strict adherence to the established methods of "'passing the word" via the chain-of-command has continued to be the traditional way the Navy communicated important information. Even if an equipment manufacturer had communicated directly with a sailor, or the engineering officer of a naval ship, such as Mr. Devries, and that information about asbestos hazards was different from what the Navy was communicating neither sailor nor officer would have little choice but to continue to follow the chain-of-command. In other words, he would have been ordered to continue to follow the established and communicated Navy procedures for his activities.

47. In summary, with the introduction of asbestos into the engine room spaces of naval vessels, the Navy initiated a progressive occupational health program to address any potential consequences of its use. Within the engineering, safety and medical departments, a recognized expertise developed which set state-of-the-art standards and industry guidelines for the handling of asbestos. Where very little scientific evidence of the potential health threat was available, the Navy created a framework of instructions and guidance to implement safeguards within its traditional command structure. The communication of the health and safety threat to personnel was accomplished through directives and the existing chain-of-command, and was not dependent on instructions from commercial manufacturers. Even in the improbable scenario in which an equipment manufacturer directly warned a sailor about the hazards of asbestos in a manner that

differed from what the Navy knew and was communicating, he would have been ordered to continue to follow the established and communicated Navy procedures for his activities.

I hold the above opinions to a reasonable degree of scientific and industrial hygiene certainty.

s/ J.C. Senter	September 3, 2013
J.C. Senter	Date

JOHN B. DeVRIES

* * *

Page 80

Q. Whose job was it to perform work on the turbines?

A. Well, it would be a machinist mate's job, but, believe me, I was on top of whoever did the work. That was the — that was necessary.

Q. Do you know if any of the work on the turbines involved the use of asbestos-containing products?

A. The turbines were insulated.

Q. And, again, is this the exterior insulation?

A. This was exterior insulation.

Q. Do you recall any writing on that insulation?

A. None.

Q. Do you know who manufactured any of the insulation?

A. I do not.

Q. And as you sit here today, do you have any personal knowledge that that exterior insulation did in fact contain asbestos?

A. I have no knowledge that it contained asbestos.

* * *

Page 330

A. Yes.

Q. Okay.

MR. REICH: You are just talking in general about —

MR. KATTNER: I'm talking in general right now.

MR. REICH: Okay.

BY MR. KATTNER

Q. With respect, however, to the selection of what insulation was put on the turbine on the TURNER at the time of its initial installation in 1945, I take it you have no knowledge as between the equipment manufacturer or the shipbuilder in Bath, Maine who selected that insulation, do you?

A. I have no knowledge.

Q. And with respect to the Navy specifications as to use of asbestos or other materials on turbines or other machinery you do not have personal knowledge as to what besides asbestos the Navy may have specified?

A. I have no personal knowledge of it.

Q. Okay. Now, and with respect to specifications that might say the equipment

* * *

Page 349

BY MR. KATTNER:

Q. The mud was used elsewhere on the pipes throughout the ship; correct?

A. The mud was used for repair of insulation on other parts of the ship.

Q. And some of these pipes with insulation you described yesterday went through the berthing or sleeping areas, correct, of the ship?

A. First of all, I don't know what went through the crew's berthing areas.

Q. How about the officers' berthing area?

A. The wardrooms may have had a pipe or two go through, not many.

Q. How about the passageways, were there pipes through there?

A. In the passageways, yes.

Q. And they had this insulation on many of them?

A. They were insulated.

Q. Now, as far as the blankets, were there blankets used on other equipment besides the turbine?

A. Yes.

Page 350

Q. And as to the content of those blankets, do you know what it was?

A. No.

Q. And as to who manufactured those blankets, do you know who manufactured them? Did they have any label or name on the blankets themselves?

A. No.

Q. Now, with respect to various signs and warnings or indicators around the ship, I understand there were — the Navy used certain indicators as to types of pipes or types of equipment; correct? There were painted markings on some things?

A. Some were marked.

Q. Okay. Do you know who as between the Navy and the manufacturers determined what markings would be on such pieces of machinery or equipment?

A. Some equipment manuals from manufacturers as General Electric specified the marking.

Q. Well, were these operational markings?

A. I do not recollect the words used or

* * *

Page 373

MR. REICH: He answered that already.

MR. KATTNER: He said he didn't. Okay.

BY MR. KATTNER:

Q. You don't know manufacturer or what composition?

A. I don't know.

Q. Okay. And just from looking at it with your naked eye, is it safe to say you can't personally identify asbestos versus mineral wool versus other fibers or insulating materials at this time, can you?

A. No.

Q. And you couldn't back then at the time in the Navy, could you?

A. I certainly couldn't then.

Q. Okay. Now, after you left the Navy, I take it your testimony is you have no further asbestos exposure that you attribute to General Electric over the course of the remaining part of your life?

A. No further asbestos exposure.

Q. Of any kind?

Page 374

A. Of any kind.

MR. REICH: To his knowledge.

BY MR. KATTNER:

Q. To your knowledge?

A. yeah. To the best of my knowledge, yes.

Q. I've got you. Now, you made reference to — you said, I know your Interrogatory Answers said several times you never smoked cigarettes. Did you ever smoke any other kind of tobacco product?

A. I think I tried a pipe once.

Q. I see. Literally only one time?

A. Too much work.

Q. I've got you. About when was that?

A. In college.

Q. Okay. That was the '52 to '57 time frame?

A. That's right. An hour of —

Q. Okay. I know there was some reference to a home inspection somewhere around 2011 at your Bridle lane property.

A. No. Gravel Hill Lane property.

Q. Gravel Hill Lane.

MR. REICH: I'm going to

* * *

Page 386

Q. — on them?

A. They were insulated.

Q. What's the purpose of insulation on the main propulsion turbines?

A. Well, a turbine converts heat energy into movement and you — superheated steam, 600 pound pressure steam is at the entry point. You don't want to lose any heat. And of course you don't want — you don't want anybody to get burned.

Q. So there were really two purposes, one for safety, people not touching it and getting burned; is that correct?

A. One is safety and one is efficiency of the operation.

Q. Now, with regard to the ship's service generator, do you recall what company manufactured that?

A. I believe it was General — it was General Electric.

Q. Okay. And do you remember whether there was any asbestos on the ship's service generator, if you recall?

A. Normal insulating material, electrical

* * *

Page 405

insulation on any of these drive turbines, you don't know, do you?

MR. REICH: And I object. He's already answered that a number of times.

BY MR. KATTNER:

Q. And you have no information that General Electric supplied any of the external insulation on any of these turbines, do you, you yourself?

A. I have no personal information.

Q. And the same thing, you have no knowledge that Westinghouse supplied any of that insulation?

A. I have no personal information to say Westinghouse supplied it.

Q. And whether the Navy specs say it was supplied bare metal or not that's something the Navy specs will tell us; is that correct?

MR. REICH: Objection, asked and answered.

MR. KATTNER: Okay. Thank you.

MR. REICH: I think this might be a good time to break for lunch.

* * *

JOHN B. DeVRIES and ROBERTA G. DEVRIES, h/w	:	COURT OF COMMON PLEAS PHILADELPHIA COUNTY
Plaintiffs,	:	DECEMBER TERM, 2012
vs.	:	
ALLEN-BRADLEY COMPANY, et al.	:	NO. 3661
	:	ASBESTOS CASE
Defendants,	:	

– – –

TUESDAY, JANUARY 15, 2013

– – –

Videotaped Discovery

Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:10 a.m., before Kathleen Woods Logue,

Professional Reporter and Notary Public there being present.

– – –

* * *

Page 40

Q. Upon graduation from Cornell did you then obtain a job?

A. No.

Q. What did you do after graduation?

A. The U.S. Navy had sent me to Cornell.

At the conclusion of my college I immediately was commissioned an ensign and reported to the USS TURNER.

Q. Do you recall the date when you enlisted in the U.S. Navy?

A. Well, properly I entered the Navy before going to Cornell as a midshipman at Cornell.

Q. When did you actively join the Navy?

A. June of 1957. Again, when I reported aboard the USS TURNER.

Q. And when were you discharged from the U.S. Navy?

A. June of 1960.

Q. Did you serve aboard any other ships or at any other bases aside from the USS TURNER?

A. No.

Q. When you were discharged from the Navy in 1960 did you then obtain a job?

A. Yes.

* * *

Page 62

that correct?

A. The caption?

MR. REICH: That's what this is called.

THE WITNESS: Yes.

BY MR. REICH:

Q. Did you also review records from the USS TURNER?

A. Is that what this —

MR. REICH: Yes. Not until after he reviewed the caption and initiated.

MR. STOKES: Okay. And we'll get to those documents briefly here.

BY MR. STOKES

Q. When you first reported to the U.S. Navy in June of 1957, where did you report to?

A. Newport, Rhode Island.

Q. And for how long did you spend, how much time did you spend at Newport, Rhode Island?

A. The TURNER was moored, moored out in the bay at Newport.

Q. Did you ever have to undergo basic training at any time?

A. No.

Page 63

Q. Did you receive any training from the U.S. Navy prior to boarding the U.S. TURNER?

A. Other than four years of Naval Science at Cornell.

Q. And when you say four years of Naval Science at Cornell, were those classes that you took towards your education?

A. Classes.

Q. Were those classes you took through your education at Cornell?

A. Please let me hear that question again.

Q. Well, let me ask you. What was the four years of Naval training at Cornell?

A. Supposedly the same training that an Annapolis grad got.

Q. And what sort of subjects did you learn though the Navy training at Cornell?

A. Navigation, leadership. I do not recollect.

Q. Did you receive any mechanical training at Cornell?

A. No, not from the Navy.

Q. Did you receive any training through that Navy training at Cornell regarding the

Page 64

operation of a ship or a Navy vessel?

A. Yes, in the sense of how you would control the ship on the bridge.

Q. Did you receive any training regarding any of the engine departments or engine rooms of the ship at Cornell?

A. No.

Q. What was your position in the U.S. Navy when you first boarded the USS TURNER?

A. Ensign.

Q. Can you describe to those of us and to the jury what an ensign is?

A. Ensign is the lowest commissioned officer in the Navy.

Q. And for how long did you serve as an ensign aboard the USS TURNER?

A. I do not recollect when I was promoted to lieutenant JG, but I was JG for half, at least half the time on the TURNER.

Q. And it's my understanding that you served aboard the USS TURNER for approximately three years; is that correct?

A. Three years.

Q. So would it be safe to say that you

Page 65

spent approximately a year and a half being an ensign?

A. I can't recollect when I was promoted to JG.

Q. What are your duties as an ensign aboard the USS TURNER?

A. I was sent to the TURNER as a surplus officer in the engineering division, titled main propulsion assistant.

Q. And as a surplus officer in the engineering division what type of duties did you perform?

A. The Engineering Department on the destroyer has the engineer officer, the damage control assistant. And since the Navy felt that they needed more attention to the main engineering spaces as main propulsion assistant I was in the engineering spaces almost continuously.

Q. Were you responsible for performing any mechanical work in the Engineering Departments?

A. I was responsible for overseeing that it was done.

Page 66

Q. Would it be safe to say that your duties did not include actual hands-on work with the mechanical equipment; is that correct?

A. Yes. That's correct.

Q. How many Engineering Departments were there aboard the USS TURNER?

A. A destroyer like the TURNER has one Engineering Department, but that—

MR. REICH: Hold on one second. Were you saying compartment or department

MR. STOKES: Department.

MR. REICH: Okay. I'm sorry. Go ahead.

THE WITNESS: But the ship has two engine rooms and two fire rooms.

BY MR. STOKES

Q. And as an ensign, were you assigned to one particular engine room or one particular fire room?

A. I was in all, all spaces.

Q. So you would have worked in both engine rooms and both fire rooms?

A. Yes.

Page 67

Q. Did you work in one particular engine room or one particular fire room with more frequency than the others?

A. Not really.

Q. When you became a lieutenant JG, did your duties change?

A. The duties were not related to the rank.

Q. What were your duties as a lieutenant JG?

A. By this time I think I was the engineer officer, the department head.

Q. What work would you perform as an engineer officer?

A. Supervising. I add very closely the work of the seamen in the engine rooms and fire rooms.

Q. Again, would it be safe to say that your work as an engineer officer did not involve personal mechanical work on any of the equipment aboard the ship?

A. No.

Q. That would be safe to say?

A. It was not safe to say that.

Q. Okay. Did your work involve any

Page 68

personal mechanical work on any of the equipment aboard the ship as an engineer officer?

A. I worked with our people.

Q. But was your work limited to supervision?

A. It was supposed to be.

Q. Were there occasions when you actually had to perform work yourself on the equipment?

A. I had to show people how to.

Q. Now, the USS TURNER, it's my understanding that that ship was built in 1945. Are you aware of that?

A. At the Bath Iron Works.

Q. And at the time of construction that would be the point in time when all the pipe lines would be installed on the ship; is that correct?

A. I believe so.

Q. At the time of construction that would be the time when the equipment was installed aboard the ship; is that correct?

A. I believe so.

Q. Would you have any knowledge of any of

Page 69

the maintenance history of the ship or the equipment aboard the ship prior to your boarding in 1957?

A. No.

Q. Would you have any knowledge as to the repair history of any of the equipment aboard the ship prior to your boarding in 1957?

A. I do not have any such knowledge.

Q. Would you have any knowledge as to whether any of the equipment aboard the USS TURNER during the time period you boarded the ship in 1957 was original to the ship when it was constructed in 1945?

A. I have no knowledge.

Q. And would you have any knowledge as to whether any components of any of the equipment aboard the ship at the time that you served on the ship were original to the equipment on the ship?

A. I have no knowledge.

Q. If we were to talk about the engineering compartments was the same work being performed in each of the two engineering compartments?

A. Essentially the same.

* * *

Page 90

oil lines; is that right?

A. Yes.

Q. You'd have pumps for waste lines as well; is that correct?

A. Yes.

Q. Do you recall any work that was performed in your vicinity on any of the pumps aboard the USS TURNER?

A. Yes.

Q. What type of work was performed in your vicinity on the pumps?

A. We were constantly putting new stuffing in the stuffing boxes.

Q. Do you recall any other work aside from putting the stuffing in the stuffing boxes on the pumps?

A. Yes. Yes.

Q. Okay. And what type of work?

A. Well, if a pump had to be removed, then the flanges had to be cleaned and sealed.

Q. Now, you just mentioned flanges in relation to pumps. Do you recall if any of those pumps did not have flanges?

A. I do not recall.

Page 91

Q. Do you recall any pumps that were connected with screw-in connections?

A. Again, I do not recall.

Q. Do you recall any pumps that were connected with solder connections?

A. There were no solder connections.

Q. Aside from replacement of the stuffing and the clean out of the flanges, do you recall any other work that was performed in your vicinity on the pumps?

A. Whatever other seals were required were —

Q. And when you say other seals, are you talking about the flanges again?

A. No. I'm talking about the innards of a pump.

Q. Did you ever personally remove any stuffing from a pump?

A. Yes.

Q. Do you recall the number of times that you personally removed stuffing from a pump?

A. No.

Q. Can you describe to me the process of removing stuffing from a pump?

Page 92

A. Whereas there is supposed to be on a ship a puller to get it out our ship never seemed to have the right tools. So our sailors would use a screwdriver. And they would pry and break and we'd end up with a pile, a cloud of dust. I was there a foot or two from the sailor doing it or showing him how to do it with the best possible way. So I was exposed to all of that dust.

MS. McGARRITY: Move to strike the nonresponsive portions.

BY MR. STOKES:

Q. When the stuffing was removed from the pumps, do you recall what color that stuffing was?

A. No.

Q. Do you recall any writing on any of the stuffing that was removed?

A. It was — you had particles here. You didn't have something that you could see writing on.

Q. So would I be correct in saying you couldn't see any writing on the stuffing?

A. Could not see writing.

Page 93

Q. And you wouldn't know when that stuffing was initially installed in the pump; is that correct?

A. I would not know.

Q. You wouldn't know who had installed that stuffing in the pump; is that correct?

A. Only if we had done it a few months earlier.

Q. Do you recall any instances as you sit here today when you did remove stuffing that you had previously installed?

A. I can remember several pumps that we —

Q. Since there's no writing on the old pack — or old stuffing that's being removed, do you know who manufactured any of the old stuffing materials?

A. I don't know who manufactured the packing that we removed or installed.

Q. Do you have any personal knowledge that any of the old stuffing did in fact contain asbestos?

A. I have no knowledge.

Q. And do you have any personal knowledge that the new stuffing did in fact contain

Page 94

asbestos?

A. I have no knowledge.

Q. Did you ever see any — strike that. How would you install new stuffing into the pumps?

A. Generally around the shaft that it was trying to seal.

Q. Would the new stuffing come in any sort of packaging?

A. I don't know that it did.

Q. Was the new stuffing precut?

A. Most cases, no.

Q. How thick is this stuffing that was being removed?

A. All different thicknesses and dimensions because you were dealing with all different pumps.

Q. Do you recall what the thinnest stuffing size would be?

A. No.

Q. Do you recall if the thinnest would be, let's say, approximately the size or smaller or larger than this wire I'm holding?

A. I don't know what the thinnest stuffing

Page 95

was.

Q. Okay. Do you recall what the thickest stuffing would have been?

A. Again, I don't know what the thickness was.

Q. Did you ever have occasion to cut any of stuffing?

A. I had occasion once or twice to show somebody how to do it.

Q. And what would you cut stuffing material with?

A. Well, I used a utility knife, not the right way.

Q. To cut the stuffing material with a utility knife, would that just take a few seconds?

A. I don't remember.

Q. Whose job was it to perform this maintenance repair work on the pumps?

A. We had a petty officer responsible for the fire room or the engine room. He would assign this normally to one of the sailors.

Q. Do you know what trade the sailor was?

A. Well, he'd be a machinist mate or he'd

Page 96

be a boiler tender.

Q. Did you ever receive any training as a machinist mate?

A. The Navy put me on this ship a surplus officer because the engineering plant was in very bad shape in 1957. The Navy sent me to the Destroyer Force Atlantic Fleet Engineering School. And I forget how many weeks it was, but it was, I suppose, eight or ten weeks or more. And we were taught not just how to operate the machinery but also how to maintain it. I probably had more training than the petty officers responsible for the spaces.

Q. Where did you go for engineering school?

A. Newport, Rhode Island.

Q. Was this when you first met up with the USS TURNER?

A. No.

Q. When did you have the engineering school?

A. I'm trying to reconstruct. It would have been the late fall, early winter of 1957, 1958.

Q. So during this eight to ten week period

Page 97

during engineering school were you off of the ship?

A. Off the ship. The ship was in the Boston Naval Shipyard at that time.

Q. During engineering school did you receive any training regarding asbestos-containing materials?

A. Never mentioned them.

Q. Going back to the pumps, when you said that the flanges were cleaned if a pump had to be taken offline, how would that occur?

A. They'd be scraped. They'd be brushed, wire brushed. I don't think we had the luxury of an electric drill with a wire wheel. So they would be done manually. And this too would create a cloud of dust.

MS. McGARRITY: Move to strike the nonresponsive portions.

BY MR. STOKES:

Q. What were you scraping from the flanges and pumps?

A. The broken seal.

Q. Did you personally ever have occasion to remove one of these broken seals from a pump

Page 98

flange?

A. No.

Q. Would it be safe to say you supervised others who performed the work?

A. I was right on top of the sailor doing it.

Q. When one of these broken seals is being removed, do you recall any writing on the broken seals?

A. No.

Q. Would you know who manufactured the seal that was being removed?

A. No.

Q. Would you have any personal knowledge that the seal being removed contained asbestos?

A. No.

Q. Would you have any personal knowledge as to when that seal was actually installed in the flange?

A. Again, only if we had installed it ourselves.

Q. For those that you did not install yourselves, would you have any personal

Page 99

knowledge as to the date of installation?

A. No.

Q. Would you have any personal knowledge as to whether any of those seals were original to the flanges with the pumps?

A. Nope.

Q. Is it your understanding that those seals would have been replaced numerous times prior to your boarding?

A. Yes.

Q. And the same with the stuffing, is it your understanding that that stuffing material would have been replaced numerous times prior to your time on the ship?

A. Packing was always being replaced.

Q. Did you ever personally have to install a new seal in the flanges?

A. I, no.

Q. Did you ever have occasion to work in the vicinity of others who installed a new seal in the flanges of the pumps?

A. Yes. I was feet away from the guy doing it.

Q. The new seals were they preformed?

Page 100

A. Yes.

Q. So the installation of the new seals would that more or less be a matter of just placing it on the flange connection and reconnecting the flanges?

A. Yes.

Q. Would there be any reason to cut any of the seal material upon installation?

A. No.

Q. Do you recall any writing on the new seals?

A. No.

Q. Do you recall any packaging for the new seals?

A. No.

Q. Do you know who manufactured any of the new seals?

A. No.

Q. Do you have any personal knowledge that the new seals contained asbestos?

A. No.

Q. You also mentioned seals of the innards of the pumps. Do you recall that testimony?

A. Yes.

Page 101

Q. And where would these seals be located?

A. Well, between the — when I say pump, I mean the pump, centrifugal pump or otherwise as what I'll call wet end and then it has a driver, normally an electric motor and the shaft would have a seal.

Q. Did you ever —

A. I should call it packing more, but anyway —

Q. Okay. So is this the same packing that we have talked about when we said stuffing?

A. Stuffing, packing.

Q. Okay. What term would you rather use, stuffing or packing?

A. Packing would be the more correct term.

Q. Okay. So when we were talking about stuffing before we were talking about packing material; correct?

A. Yeah.

Q. Did this packing material, the innards of the pump did that differ at all from the packing you had talked about earlier?

A. I can't recollect at this time. Wait a minute. The packing was different, different

Page 102

for different pumps.

Q. There would be different compositions of packing for different pumps; is that correct?

A. I believe so.

MR. REICH: Don't guess.

BY MR. STOKES:

Q. And for any of the packing of the innards of the pump, when that packing was removed, do you recall any writing on the old packing?

A. No.

Q. Do you know who manufactured any of the old packing —

A. No.

Q. — in the innards of the pump?

A. No.

Q. Do you have any personal knowledge that the old packing of the innards of the pump contained asbestos?

A. No.

Q. Would you have any knowledge as to the installation history of the old packing that was being removed from the innards of the pump?

Page 103

A. No.

Q. Would you have any knowledge that any of that packing material in the innards of the pump were original to the pump?

A. No.

Q. It's your understanding that that packing would have been changed numerous times prior to your service on the ship?

A. Yes.

Q. Do you recall any packaging for any of the new packing that was being installed on the innards of the pump?

A. No.

Q. Do you recall any writing on the new packing that was being installed on the innards of the pump?

A. No.

Q. Do you know who manufactured any of the new packing that was being installed on the innards of the pump?

Page 104

A. No.

Q. Do you have any personal knowledge that the new packing being installed on the innards of the pump contained asbestos?

A. No.

Q. Did you ever read any specifications for any of the pumps?

A. Yes.

Q. And what was the nature of these specifications?

A. Drawings, materials of construction.

Q. Were these materials that were prepared by the U.S. Navy?

A. Or by the pump manufacturer.

Q. Do you recall the mention of asbestos in any of the materials you reviewed in relation to pumps?

A. I never saw the word asbestos relating to any of the pumps.

Q. We have now talked about the packing material and the seals that were used in the flanges of the pumps. Do you associate asbestos with any other work performed on the pumps?

A. No.

Q. And as we talked about earlier, you don't know if any of that work actually did involve the use of asbestos; is that correct?

Page 105

A. I do not know.

Q. Do you know who manufactured any of the pumps aboard the USS TURNER?

A. There were a number of manufacturers.

Q. As you sit here right now do you recall any of those names?

A. DeLaval, I think it was Warren. There was another one that was quite widely used.

MR. REICH: Would it help you to look at —

THE WITNESS: Yes.

MR. STOKES: We'll get to that.

MR. REICH: Okay.

MR. STOKES: I'll go through it.

BY MR. STOKES:

Q. Right now we just want to know what you remember and then we'll go through the materials.

A. I don’t — there were three primary — Buffalo was the third I’m pretty sure.

Q. Do you recall a Worthington pump?

A. I recall the Worthington label.

Page 106

Q. Do you recall any other pump manufacturers as you sit here without looking at those materials?

A. No.

Q. Sir, we've now talked about the boilers, the turbines, the pumps, the electrical equipment, the electrical generators, the diesel generators. Aside from that equipment, do you recall any other equipment on which repair or maintenance work was performed in your vicinity?

A. I certainly was responsible for other equipment, but I don't recollect right now.

Q. And do you associate asbestos with any of your other work performed aboard the USS TURNER other than what we have talked about?

A. No.

Q. It's my understanding that in the USS — strike that. It's my understanding that in the U.S. Navy there's a chain of command?

A. Yes.

Q. I've heard it said before the right way, the wrong way and the Navy way. Are you familiar with that term?

Page 107

A. I've heard it.

Q. Essentially when you serve in the USS — strike that. I'm sorry. When you serve in the U.S. Navy, you have to abide by the Navy orders; is that correct?

A. Yes.

Q. Within that chain of command the orders come down; correct?

A. Yes.

– – –

(Whereupon, there was an interruption in the deposition.)

– – –

MR. STOKES: I'll object to that.

MR. REICH: You ain't seen nothing yet.

BY MR. STOKES:

Q. And if you didn't abide by the orders you would be punished; is that right?

A. Yes.

Q. Did you ever have occasion when you refused an order?

A. No.

Page 108

Q. What would happen if you did refuse an order?

A. Well, certainly there would be no promotion.

Q. And essentially every aspect of your life in the U.S. Navy is regimented and dictated by the U.S. Navy; is that right?

A. Yes.

Q. The Navy, they instruct you when to wake up; is that right?

A. Yes.

Q. They instruct you when to go to bed; is that right?

A. No.

Q. They tell you when lights are out; is that right?

A. Yes.

Q. They tell you when you are going to eat your meals; is that correct?

A. Yes.

Q. They dictate what work you perform on the ship; is that correct?

A. Yes.

Q. They dictate how to perform your work on

Page 109

the ship; is that correct?

A. Yes.

Q. The Navy determines what materials you will be using to perform your work; is that correct?

A. Yes.

Q. In order for you to leave the ship or board the ship you have to salute the flag; is that correct?

A. Yes.

Q. You really can't do much in the U.S. Navy without permission from the Navy; is that right?

A. Yes.

Q. Did you look to the Navy when it came to issues of health and safety?

A. Yes.

Q. You relied on the Navy when it came to your health and safety; is that right?

A. Yes.

Q. If the Navy had knowledge of any dangerous products or activity, you relied on the Navy to convey that knowledge; is that right?

Page 110

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;

Page 111

is that right?

A. Yes.

Q. And then the yard birds come out and they rip everything out of the ship; is that correct?

A. Yes.

Q. Were you present when the yard birds worked on the ship?

A. I was present on the rip out in Boston and then again in Brooklyn. I never was present when things were put back together.

Q. When these rip-outs were performed in Boston and Brooklyn, would it be safe to say that yard birds would go in and remove all of that pipe covering from the ship?

MS. McGARRITY: Objection, form.

THE WITNESS: I can't recollect what was done with piping.

BY MR. STOKES:

Q. These rip-outs on the ship, that's adusty process, is it not?

A. Very dusty.

Q. That would be one of the dustiest

Page 112

processes aboard the ship, is that right?

A. Yes.

Q. And it would create clouds of dust; is that right?

A. Yes.

Q. I've heard people say that when rip-outs are performed it's similar to — it creates a situation where it looks like it's snowing. Would you describe it that way?

A. Well, I would suggest that when you removed, say, a pump for maintenance, removing of the insulation, assuming this was an insulated pump, would create a cloud and so you would have clouds of dust.

Q. Now, you didn't mention insulation in relation to the pumps earlier. Was there insulation on any of the pumps?

A. Oh, sure.

Q. Would it be safe to say that not all the pumps were insulated?

A. A cold water service pump doesn't need to be insulated.

Q. So you would have insulated and noninsulated pumps; right?

Page 113

A. Yes.

Q. And the Navy would determine which pumps were to be insulated and which pumps were not to be insulated; correct?

A. The original design determined that.

Q. And those are designs that are specified by the Navy; correct?

MR. REICH: Objection.

BY MR. STOKES:

Q. If you know.

A. I have no way to know.

Q. Were you ever present when insulation was removed from a pump?

A. Oh, yes.

Q. Do you recall any writing on any of the old insulation removed from a pump?

A. No.

Q. Do you know who manufactured any old insulation removed from a pump?

A. No.

Q. Do you know when that insulation was installed on the exterior of the pump?

A. No.

Q. It's your understanding that the

Page 114

insulation of pumps that occurs after the pump is delivered and installed on the ship; correct?

A. Yes.

Q. And the insulation work is performed by members of the U.S. Navy; is that correct?

A. Yeah, either members of the crew or members of the supporting shipyard.

Q. So you wouldn't know if any of that insulation was original insulation that was installed at the shipyard or whether it was installed by other crew members; is that correct?

A. Yes.

Q. Do you have any personal knowledge that any of the old insulation on the pumps contained asbestos?

A. No.

Q. Did you ever personally install new insulation on any of the pumps?

A. No.

Q. Were you ever present when others installed new insulation on the pumps?

A. Yes.

Page 115

Q. Do you recall any packaging for the new insulation?

A. No.

Q. Do you recall any writing on the new insulation?

A. No.

Q. Do you know who manufactured any of the new insulation?

A. No.

Q. Do you have any personal knowledge that the new insulation contained asbestos?

A. No.

Q. Do you know who supplied any of the new insulation?

A. No.

Q. Do you know who supplied any of the materials that were used aboard the USS TURNER?

A. No.

Q. It's my understanding that aboard these Naval ships your sleeping quarters they were bunks; is that correct?

A. Yes.

Q. How many bunks were there aboard the USS

Page 116

TURNER?

A. Well, first of all, we had two officers' wardrooms. The engineer officer's stateroom was in the aft of wardroom. So there were probably four or five other officers in the aft of wardroom with me.

Q. Were there bunks in the aft of wardroom?

A. I guess we'd call them bunks.

Q. Were the beds on different levels of the wardroom?

A. I think they were — yeah. They were two high.

Q. Do you recall which level you slept on in the wardroom?

A. Well, when I was an engineer officer, I slept in the lower bunk in the engineer officer's stateroom.

Q. Okay.

A. And the bunk above me stayed empty.

Q. Was there insulated pipe in the stateroom?

MS. McGARRITY: Objection, form.

THE WITNESS: I don't know.

Page 117

BY MR. STOKES:

Q. Where did you — where did you sleep before you received a promotion and went to the stateroom?

A. In the aft of wardroom.

Q. Were there insulated pipes in the aft of wardroom?

MS. McGARRITY: Objection, form.

THE WITNESS: I don't know.

BY MR. STOKES:

Q. Did the U.S. Navy ever warn you regarding the hazards of asbestos?

A. Absolutely not.

Q. If the U.S. Navy had known the hazards of asbestos would you have expected them to give you a warning?

MR. REICH: Objection. I object to the form of that. I mean, he has no way of guessing what the Navy would tell him based on what they knew or didn't know. I mean, that's pure speculation.

MR. STOKES: It is a discovery deposition.

* * *

JOHN B. DeVRIES	:	COURT OF COMMON
and	:	PLEAS
ROBERTA G.	:	PHILADELPHIA COUNTY
DeVRIES,	:	
h/w	:	
Plaintiffs	:	DECEMBER TERM, 2012
	:	
vs.	:	
	:	NO. 3661
ALLEN-BRADLEY	:	
COMPANY, et al.		ASBESTOS CASE
Defendants		

– – –

WEDNESDAY, JANUARY 16, 2013

– – –

Videotaped Discovery

Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:15 a.m., before Kathleen Woods Logue, Professional Reporter and Notary Public there being present.

– – –

* * *

Page 405

insulation on any of these drive turbines, you don't know, do you?

MR. REICH: And I object. He's already answered that a number of times.

BY MR. KATTNER:

Q. And you have no information that General Electric supplied any of the external insulation on any of these turbines, do you, you yourself?

A. I have no personal information.

Q. And the same thing, you have no knowledge that Westinghouse supplied any of that insulation?

A. I have no personal information to say Westinghouse supplied it.

Q. And whether the Navy specs say it was supplied bare metal or not that's something the Navy specs will tell us; is that correct?

MR. REICH: Objection, asked and answered.

MR. KATTNER: Okay. Thank you.

MR. REICH: I think this might be a good time to break for lunch.

Page 406

THE VIDEOTAPE OPERATOR: The time is 12:07. We're going off the video record.

– – –

(Whereupon, a lunch break was taken at this time.)

– – –

THE VIDEOTAPE OPERATOR: The time is 1:06. We are back on the video record.

– – –

EXAMINATION

– – –

BY MS. ZUMSTEG:

Q. Good afternoon, Mr. DeVries. My name is Amy Zumsteg from the law firm of Leader and Berkon in New York. My questions to you pertain to DeLaval pumps. Okay?

A. Yes.

Q. All right. Did you supervise work on a DeLaval pump —

THE COURT REPORTER: I'm sorry. I can't hear your question.

BY MS. ZUMSTEG:

Page 407

Q. Did you supervise work performed on a DeLaval pump?

A. Yes.

Q. And did you personally perform hands-on work on a DeLaval pump?

A. Maybe occasionally.

Q. Over the three years of work on the USS TURNER, how many times would you say you performed hands-on work on a DeLaval pump?

A. Only a handful. And that would be to demonstrate to a seaman how to do something.

Q. And your work involving DeLaval pumps was only aboard the USS TURNER; is that correct?

A. Yes.

Q. How did you know that a pump was manufactured by DeLaval?

A. You had many — DeLaval had many pumps on the TURNER. Several had nameplates, several had manuals, operating instructions from DeLaval. We had to know who the pump producer was of course.

Q. How many DeLaval pumps were on the ship?

A. Many pumps. I can't recollect how many.

Page 408

Perhaps several dozen. DeLaval was the major supplier of pumps for this class of destroyer.

Q. Where were they located on the ship?

A. I remember condensate pumps, auxiliary condensate pumps, feed pumps I believe, I believe even some oil booster pump. There were a wide array of applications and uses.

Q. They were in the engineering spaces; is that correct?

A. I'm referring to those that were in the engineering spaces.

Q. Can you be more specific than that?

A. Well, the engineering spaces would be the engine rooms, fire rooms.

Q. So both of those types —

A. Yes.

Q. — of rooms?

A. Yes. Yes. Yes.

Q. Of the several dozen that you recall, how many of those did you personally work on?

A. Of the several dozen, I was present for supervising and sometimes showing how to do the work on those pumps.

Q. On all several dozen?

Page 409

A. My responsibility involved making — keeping the ship running and needed those pumps to keep running. And our crew unfortunately was not well trained. So I stood on top of people while they were working on pumps, as I said, occasionally showing them what to do, but always supervising what was being done.

Q. And what was being done to the DeLaval pumps?

A. Many times the pumps had to be repacked. No fault of DeLaval, but the mounting platforms, or whatever you call them, had corroded. This was not a new ship. This was an old ship. And the bottom, the result was misalignments. And packing was just a constant issue on the TURNER.

Q. You said occasionally you performed hands-on work?

A. In this — let's talk about repacking. Properly you have a tool to pull out the old packing. No such tool existed on the TURNER. We would use a screwdriver. Excuse me. And I would on occasion show people how to use that

Page 410

screwdriver to pry or chop or break up the packing.

Q. How long did that sort of work take?

A. It depends on the condition of the pump.

Q. Would it be under an hour?

A. It could be.

Q. Do you remember what drove DeLaval pumps?

A. Some were driven by steam turbine. Some were driven by electric motors. I recollect that the main condensate pumps were turbine driven and turbine supplied by DeLaval as well as the wet end of the pump.

Q. Did you perform work on DeLaval turbines?

A. As a part of the assembly, yes.

Q. Do you recall what flowed through the DeLaval pumps, the various types?

A. Varied on the application. I just spoke of condensate pumps, feed pumps would — and I remember there was an oil pump. And recognize that I didn't do the work except the exceptional time when I was showing someone.

Q. Were there some pumps that ran cold

Page 411

applications?

A. Cold?

Q. Yes.

A. That we had some pumps that ran, for instance, water service for the portable water service.

Q. And that would be ambient temperature water?

A. That would be ambient. I can't say whether that was a DeLaval pump or somebody else's.

Q. Were the DeLaval pumps similar in size?

A. They varied by the application. They were both vertical and horizontal.

Q. Do you know the maintenance history of DeLaval pumps, the maintenance history of them?

A. The ship had, as it should, a maintenance card on each piece of equipment. The Engineering Department would maintain those cards. They were reasonably up to date.

Q. Do you happen to know whether the components in the pumps you worked on were original to the equipment?

Page 412

A. I have no knowledge, but I'm sure, for example, the packing that might be replaced so frequently was not original.

MS. ZUMSTEG: Thank you, sir. Those are all my questions.

THE WITNESS: Thank you.

MS. ZUMSTEG: Thank you.

MR. REICH: Okay. Go off the record for a second.

THE VIDEOTAPE OPERATOR: 1:14, we're going off video record

\- - -

THE VIDEOTAPE OPERATOR: The time is 1:15. We're back on the video record.

\- - -

EXAMINATION

\- - -

BY MR. REICH:

Q. Mr. DeVries, you have testified that there were as many as a couple of dozen DeLaval pumps on the TURNER. How frequently would it be necessary to replace the packing on any one of those pumps, on any DeLaval pump?

Page 413

A. Well, each pump was a separate entity. I — I mentioned earlier that packing was a problem probably because the pumps and the driver could come out of line and out of line because the support was corroded, bent, abused, whatever.

Some of those pumps it seemed like we were repacking constantly. Now, again, I — I didn't do that. I stood over the person doing it. And a pump that was giving so much trouble I intentionally stayed through most of the process.

And, of course, this process, this removal of packing created a cloud of dust. And I was breathing the dust because we were trying to determine by close inspection and close supervision what was causing this constant leak.

Q. And what would have been used to pack the high pressure or high temperature DeLaval pumps?

A. High pressure, high temperature insulating materials, thermal insulate — packing material, whatever, would have been I

Page 414

would guess — I can't say I guess. The industry would use asbestos.

Q. Okay. And tell us how with the screwdriver the packing would be removed, the old packing? And why was it necessary? What would happen to the packing that caused it to need to be removed?

A. Well, you wouldn't repack unless it was leaking. And to remove the packing, I said earlier, we didn't have any time I was on that ship, a proper removal tool, lost, whatever. We would use a screwdriver and chip, chop, I should say, pry loose the packing which would break up and create dust.

Q. And what would happen with that old packing that was being removed?

A. It'd be discarded.

Q. Where did the new packing come from?

A. From the ship storeroom.

Q. And what would your training and knowledge have indicated the composition of that new packing for the DeLaval pump would have been?

A. My knowledge at the time was that the

Page 415

high temperature applications would require asbestos.

Q. And how did the new packing come? Was it precut or did it need to be somehow adjusted to fit into the particular pump?

A. There were a number of different packings for different pumps. Some may have been precut. More commonly it was a rope that wrapped.

Q. And how would you get the right size for that particular pump?

A. Cut off a piece.

Q. What would you cut it with?

A. Some sort of a knife.

Q. And when you cut it with the knife, did that cause any kind of debris or dust?

A. Not much.

Q. Now, would it be necessary to take a pump or a turbine off line or do something with it before you opened it up and took the packing out?

A. Well, you'd have to —

DEFENSE COUNSEL: Objection, leading.

Page 416

THE WITNESS: — remove the insulation. Assuming we're working with a hot fluid and a steam driven pump, you would have to remove the insulation from both the driver and the pump.

BY MR. REICH:

Q. So what kind of insulation would be on the DeLaval driver or pump? When you say driver you mean turbine?

A. Turbine or electric motor.

Q. Or electric motor. Okay.

A. I recollect on several of these larger pumps there was a blanket. And otherwise it would be I guess a paste type insulation.

Q. What would happen when — I'm sorry.

A. That would create, that would create a cloud of dust.

Q. Okay. What would?

A. The removal of the — the removal of the insulation.

Q. And did you breathe that dust?

A. Of course.

DEFENSE COUNSEL: Objection.

THE WITNESS: I was as close

Page 417

to the pump — closer than I am to you right now. You couldn't help breathing it.

BY MR. REICH:

Q. Indicating about a foot or less?

A. Yeah. You couldn't help but breathe it.

Q. Now, how many seals or gaskets would be on a DeLaval pump on average?

A. Well, you would have an input and an output on the fluid end. And so that would give you two seals.

Q. Okay.

A. Two gaskets for the lines.

Q. Now, how frequently would it be necessary to change the seals or gaskets on the DeLaval pumps?

A. Since the pumps probably had alignment issues, the gasket sometimes had to be changed frequently also. I didn't make that clear. Let me start again. The gaskets would be changed when there was a leak. The leak may have occurred because of a misalignment caused by this supporting structure. At any rate, some pumps we had to replace those gaskets a number of times and some not so often.

Page 418

Q. When you needed to replace those gaskets, was it necessary to disturb the outside insulation?

DEFENSE COUNSEL: Objection.

THE WITNESS: Not to replace the gaskets, but the insulation was usually removed before replacing the gaskets for the flanges.

BY MR. REICH:

Q. Okay. And describe for us how the gaskets for the flanges on the DeLaval pumps and turbines would have to be done?

A. The flanges were pulled apart. In doing so the gasket would leave fragments, would break and leave fragments on both surfaces. To remove the fragments you would scrape and wire brush the surfaces until they were clean.

Q. And what would happen when somebody wire brushed the surface?

A. Create dust.

Q. Did you breathe it?

A. Again, if you're looking down here to see how clean it is, you're in the cloud of dust.

Page 419

Q. Why was it so important that the flange be perfectly cleaned from the gasket material that had stuck to it?

DEFENSE COUNSEL: Objection.

THE WITNESS: If it wasn't clean, it wouldn't seal properly. The reinstallation wouldn't seal properly.

BY MR. REICH:

Q. And do you remember whether the replacement gaskets were from a sheet gasket material or were they precut, if you remember?

A. I don't remember.

Q. Okay. With regard to the old pieces of gasket that were being removed and chipped off and wire brushed, what would happen to those?

DEFENSE COUNSEL: Objection.

THE WITNESS: Be discarded.

BY MR. REICH:

Q. Well, where would they end up while they were being removed?

A. Probably in a little pile of trash alongside where the person was working.

Q. And whose job was it to sweep that stuff up and get it out of there?

Page 420

A. I guess the sailor who did the work cleans —

Q. All right.

A. — was trained to clean up after himself.

Q. Did the sweeping of these asbestos gasket pieces or packing pieces, what would happen when that was swept up?

DEFENSE COUNSEL: Objection, leading.

THE WITNESS: I can't of personal knowledge be certain. You get some dust. How much? By this time I was no longer on the scene.

BY MR. REICH:

Q. Okay. Had you ever seen the material swept up ever?

DEFENSE COUNSEL: Objection, calls for speculation.

THE WITNESS: I can't recollect it.

BY MR. REICH:

Q. Okay. That's fine. Do you know if any of the DeLaval pumps were serviced during any

Page 421

of the visits either to the Boston or Philadelphia or New York Shipyards, Brooklyn?

A. I was not involved in the Philadelphia Shipyard work. In the Boston and the New York Naval Shipyard work, I believe that several of the DeLaval pumps were actually removed from the ship, but they certainly had shipyard service in both yards.

Q. And what would happen before those DeLaval pumps could be removed from the ship?

A. Sometimes the insulation was removed. Since the yard workers did it, I wasn't present for much of that — for the removal of a pump if the pump was removed. If they're serviced on — were serviced on board without removal, it would be very much as I have described ship work personnel doing it except they would do it with the proper tool.

Q. Were you present when the DeLaval pumps that had been removed from the ship were put back on?

A. No.

Q. When you got back to the ship, did you see the DeLaval pumps back in place?

Page 422

A. Well, in both cases, yes.

Q. Did you see any warning labels with regard to the dangers of breathing in asbestos on any of the DeLaval pumps or turbines?

A. I did not.

Q. Did you see any warning labels or warnings with regard to the dangers of breathing in asbestos on any of the DeLaval manuals?

A. I don't recollect seeing any.

MR. REICH: I have no further questions.

– – –

EXAMINATION

– – –

BY MS. ZUMSTEG:

Q. Mr. DeVries, I have a few follow-up questions. Did you ever read a DeLaval manual?

THE VIDEOTAPE OPERATOR: Excuse me. Would you mind putting your mike on?

BY MS. ZUMSTEG:

Q. Did you ever read a DeLaval manual?

Page 423

A. I read portions at least of a DeLaval manual.

Q. And you replaced packing when the pump was leaking; is that correct?

A. Yes.

Q. Was that packing wet then?

A. Some was damp. Some was not.

Q. And you replaced gaskets on the pumps when they were leaking; correct?

A. Yes.

Q. And were those gaskets wet?

A. They were usually wet.

MS. ZUMSTEG: That's all I have.

MR. REICH: I have nothing further.

THE VIDEOTAPE OPERATOR: The time is 1:29. We're going off the video record.

MS. ZUMSTEG: Thank you, sir.

THE WITNESS: Thank you.

MR. MASTROIANNI: Alan, I may have a couple after anyone on the phone has questions.

Page 424

MR. REICH: Okay. If it's just a couple. I'm not going to have everybody going again.

MR. MASTROIANNI: Yes. Okay.

MR. REICH: Is there anybody on the phone who wants to ask any questions?

MR. PITT: No.

MR. REICH: Is there anybody else over here who wants to ask product questions? All right. Go ahead. Why don't you go if you just have a couple minutes. That's fine. And then we'll go into the general medicine and stuff.

THE VIDEOTAPE OPERATOR: The time 1:30. We're back on the video record.

– – –

EXAMINATION

– – –

BY MR. MASTROIANNI:

Q. Good afternoon, Mr. DeVries. Tom Mastroianni again. I asked you some questions yesterday pertaining to the Foster Wheeler condensers on board the TURNER. There was just a few things I wanted to — I needed to

* * *

JOHN B. DeVRIES	:	COURT OF COMMON
and	:	PLEAS
ROBERTA G.	:	PHILADELPHIA COUNTY
DeVRIES,	:	
h/w	:	
Plaintiffs	:	DECEMBER TERM, 2012
	:	
vs.	:	
	:	NO. 3661
ALLEN-BRADLEY	:	
COMPANY, et al.		ASBESTOS CASE
Defendants		

– – –

THURSDAY, JANUARY 17, 2013

– – –

Videotaped Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:15 a.m., before Kathleen Woods Logue, Professional Reporter and Notary Public there being present.

– – –

* * *

Page 18

A. We have four grandchildren.

Q. What are their names?

A. Alexandra, Taylor, Daniel and Ryan.

Q. And do you enjoy spending time with them when you are able to?

A. We try and spend as much time as we can.

Q. Where do they live?

A. They live in California.

Q. And did you travel to California to visit with your children and your grandchildren?

A. We have done so, yes.

Q. Okay. And sometimes they come —

A. Sometimes they come east.

Q. So you told us a little bit earlier that after you graduated from Cornell with your Bachelor's degree in chemical engineering you served in the military. Can you tell us a little bit about what that service involved?

A. Upon commissioning I was ordered to the ship the USS TURNER DDR-834.

Q. What kind of ship is the USS TURNER?

A. The TURNER is a destroyer that had been outfitted to be a radar picket destroyer

Page 19

operating in the van of a carrier task group.

MR. REICH: Okay. Now, we're going to go off the record for just a moment here.

THE VIDEOTAPE OPERATOR: The time is 10:24. We're going off the video record

– – –

(Whereupon, a discussion was held off the record.)

– – –

THE VIDEOTAPE OPERATOR: The time is 10:25. We're back on the video record.

BY MR. REICH:

Q. Okay. Mr. Devries, we've got a picture of a ship. Can you tell us what you see there?

A. I see a destroyer with the number 834 which would be the TURNER.

Q. And is that the ship that you were stationed to when you entered the service?

A. I was on the TURNER all three years.

Q. And when you say three years, when did you first get on the TURNER and when did you

Page 20

last get on the TURNER? Or I'm sorry. When did you first get on the TURNER and when did you leave?

A. I reported I believe it was June of 1957. As I said, upon commissioning which was the same day as graduation at Cornell, I was directed to the TURNER. Maybe with a couple days of travel time. I left the TURNER in June of 1960.

Q. When you first got on the TURNER, what was your rank and what were your responsibilities in June of 1957?

A. The rank was ensign. The billet was main propulsion assistant. The responsibilities were to improve the operations of the engine, engine rooms and fire rooms, boiler rooms.

Q. Okay. Now, that sounds like a big responsibility. I'm going to ask you to try and break that down for us a little bit. First of all, let's talk about engine rooms. How many engine rooms were there on the TURNER?

A. There were two engine rooms on the

Page 21

TURNER as any Gearing class destroyer.

Q. Okay. When you say Gearing class, were there a certain number of destroyers that were made pretty much the same way at around the same time?

A. Yes.

Q. Okay. And they're named after —

A. When I said Gearing class, I presume Gearing was the first of the string.

Q. And are they usually named after officers or —

A. I don't know how the Navy named ships, but they do name them after individuals.

Q. Okay. Now, you said that there are two engine rooms. What kind of equipment was in those engine rooms that came under your responsibility as main propulsion assistant?

A. The TURNER had two drive shafts turning two propellers. One is turned by the — the turbine in one engine room, the other is turned by the turbine in the aft of engine room.

Q. Now, aside from the turbine in the engine room, what other kinds of equipment was

Page 22

in there on the TURNER?

A. Many pumps servicing the condensers and feed pumps and such, electro — electrical generating plant, switchboard, electrical switchboard.

Q. Was there any difference in the type of equipment as you have started to describe for us between the two separate engine rooms or was it pretty much a mirror image?

A. They were designed to be mirror images.

Q. Approximately how big was the engine room? Are you able to estimate or guesstimate for us?

A. I estimate it was maybe 30 to 40 feet more or less square.

Q. Okay. And at any given time how many men would be working in the engine rooms to maintain the equipment and make sure that the TURNER was running properly?

A. If we were underway you would have a normal watch. If we were in port doing maintenance all of the machinist mates would be in their respective engine room.

Q. And approximately how many would be in

Page 23

one engine room at a time or could there be, if you can estimate for us? If not —

A. I can't really, can't really answer that. And an estimate would be quite wide.

Q. Okay. Now, was it necessary under your responsibility to see that the equipment in those two engine rooms were running properly?

A. Yes.

Q. What would happen and what would you have to do to make sure that that equipment was maintained, repaired properly?

A. We would initiate a repair to the equipment, supervise their repair and because unfortunately our crew was relatively inexperienced sometimes help and show them how to do the portions of the repair.

Q. Again, can you briefly describe for us some of the repairs that you supervised in the two engine rooms on the TURNER during the three years that you were stationed there?

A. Most all of the repairs in terms of time were on pumps, various types of pumps.

Q. And what kind of repairs had to be done to the pumps while you were there?

Page 24

A. Well, they had to have shaft gas – not gasketing. I call it stuffing boxes refilled, but —

Q. Is that the packing material?

A. Packing material.

MR. WEINBERG: Objection.

THE WITNESS: Packing —

MR. WEINBERG: Let's go off the video for a second.

THE VIDEOTAPE OPERATOR: The time is 10:32. We're going off the video record.

MR. WEINBERG: I let it go with leading questions during the preliminary, but now we're going into the product ID. SO I'm going to continually object to the leading questions, Alan. So it's your choice on how you want to proceed.

MR. REICH: That's fair. Thank you. We can go back on the record, please.

THE VIDEOTAPE OPERATOR: The time is 10:33. We are back on the video record.

Page 25

BY MR. REICH:

Q. So what materials would have to be replaced or repaired on the pump?

A. Packing seals and also the gaskets between the pump and the line coming to it, flanges, flanges.

Q. And when you say a line, what do you mean by a line?

A. Well, pumps move liquids and liquids come through piping I guess I would call it. And these were generally connected with flanges.

Q. Okay. And if you could explain to the ladies and gentlemen of the jury, please, first what a flange is?

A. A metal, a flat metal face, it's a metal device attached to the pipe.

Q. What's the purpose of a flange?

A. And then there's a flange on, say, the pump on the other side. It's a way — it's a way to connect the piece of equipment against, say, a pump into the system.

Q. And you said that there were gaskets. How would the gaskets — where would the

Page 26

gaskets be with regard to the flanges?

A. The gasket is between the two metal faces.

Q. And what would happen when it was necessary to — well, strike that.

Why would it be necessary to do anything with those flanges and those gaskets?

A. Well, either to remove the unit itself or just to correct for leakage.

Q. And describe for us, please, the process in replacing, removing and replacing the gaskets that went between the flanges?

A. When the two flanges were broken apart the existing gasket would break.

Q. And what would happen to the pieces?

A. And the pieces would fall, but also they would adhere to the flange faces requiring they'd be scraped, wire brushed, however removed.

Q. And what would happen when the men would scrape and wire brush these pieces of gasket off the flanges?

A. They would become airborne dust.

Page 27

Q. Okay. And how close were you to those flanges when that was being done?

A. Right next to the sailor doing the work.

Q. And did you breathe that dust?

A. I was in the cloud.

Q. Now, why was it important to remove these pieces of gasket that stuck to the flange? Why couldn't they just be left there?

A. Because when the unit was reassembled, the flanges were reassembled they — well, they'd leak. The gasket needed a clean surface.

Q. And was this a process that had to be done every time a gasket needed to be replaced?

A. Whenever a gasket was replaced the cleaning process was required.

Q. Now, you also mentioned other — another process that had to be done with regard to the pumps.

A. I mentioned the need for repacking pumps.

Q. And what was the — what were the pumps repacked with?

Page 28

A. Packing materials. Consider as an example a rope material.

Q. Okay. And what was the process, if you can describe for us, for removing and replacing the packing material on the pumps?

A. The process would be to pull the old packing out. Unfortunately, the TURNER never seemed to have a packing pulling tool as they should. So the process became one of chipping and twisting and prying with a screwdriver.

MR. WEINBERG: Objection. Move to strike those portions of the answer nonresponsive to the question.

BY MR. REICH:

Q. Why was it difficult to remove the packing material on the pumps on the TURNER?

A. Not limited to the TURNER it would — it would be sort of hardened around the, the shaft.

Q. Okay. And what would happen when the packing material was disturbed and picked out with the screwdriver as you've described?

A. Again, the packing material would break up much like the gasket and there would be

Page 29

airborne dust.

Q. Did you breathe that dust?

A. Yes.

Q. How close were you to this process when this was being done?

A. If I was looking to see what was going on, I could be just a foot away from the — from the packing.

Q. How frequently would gaskets and packing need to be replaced on the various pumps?

A. I can't answer quantitatively, but the TURNER had a lot of difficulties with its pumps. And so it was a frequent occurrence.

Q. Approximately how many pumps would you say were on the TURNER that you were responsible for?

A. Again, I can't answer quantitatively, but there were dozens of pumps.

Q. Aside from the pumps, what other equipment was in the engine room?

A. Well, did we start with condensers, the main condenser and the condensate pumps from the condenser, the electric generating plant.

Q. Okay. With regard to the pumps, let's

Page 30

step back for a second, what kind of materials were going through these pumps, the various pumps?

A. Everything from water, hot water to, not in the engine room necessarily, in the fire rooms, hot oil, hot fuel oil, hot bunker oil.

Q. Okay. And did you receive any kind of training as to what kinds of materials either for the gaskets or the packing that would be required for hot applications?

MS. McGARRITY: Objection, form.

THE WITNESS: Training, and I would say for all engineers, not just Navy people, at that time said you would use asbestos for high temperature applications.

MR. REICH: Can we go off the record for a second?

THE VIDEOTAPE OPERATOR: The time is 10:41. We're going off the video record

– – –

(Whereupon, a discussion was held off the record.)

Page 31

– – –

THE VIDEOTAPE OPERATOR: The time is 10:41. We are back on the video record.

BY MR. REICH:

Q. Okay. And you started to describe for us some of the other equipment in the engine room. What was the equipment that ran the propeller shaft?

A. This was the main turbine.

Q. The main turbine. And what powered that main turbine?

A. High pressure steam from the boiler.

Q. And do you — can you tell us whether there was the need for any kind of insulation on those turbines?

DEFENSE COUNSEL: Objection, form.

THE WITNESS: Any hot surface either to maintain the efficiency of the turbine or to protect a crew member from burns would be insulated.

BY MR. REICH:

Q. So how would you relate that to the

Page 32

turbines?

A. Well, the turbines were insulated just as some pumps were insulated.

Q. Was it ever necessary to disturb the insulation that was on those turbines in the two engine rooms on the TURNER while you were present?

A. Yes.

Q. And can you tell the ladies and gentlemen of the jury what might require that or what did require that?

A. Periodic inspections required by the Navy required opening and checking, for example, thrust bearing clearance, periodic — well, and sometimes there would be some repairs required.

Q. And what would happen? How would you get to the equipment down to the metal?

A. You would remove the insulation.

Q. What would happen when that insulation was handled or removed?

A. As in any time with insulation it would become dust. There would be considerable dust.

Page 33

Q. And did you breathe that dust?

A. Yes.

Q. How close were you to the turbines when they were being worked on?

A. A requirement of the engineer officer is to be at the turbine whenever it is opened and worked on.

Q. How frequently would that happen over the three years that you were assigned and on the TURNER?

A. I suppose maybe three to six times.

Q. Is that in each turbine?

A. Yes.

Q. And how many turbines were there altogether on the —

A. Two turbines, one powering the starboard shaft, one powering the port shaft.

Q. And for the ladies and gentlemen of the jury who don't know the difference between starboard and port, can you tell us if we're facing the front, if we're on the ship facing forward which is starboard and which is port?

A. Right side is starboard.

Q. Okay. And the left side is?

Page 34

A. Port.

Q. Okay. Now, you also talked to us about other equipment. You had the pumps that were in the fire room and the turbines. Were the pumps — I don't remember if I asked you this question. I apologize if I did. What were the temperatures on the pumps, some of them?

A. Well, the range was from fresh water service which would be room temperature to very hot water condensate from the condenser.

Q. Okay. And the hot — the pumps that had hot applications, did they need any special treatment that the cold water pumps might not have needed?

A. As I stated earlier, anything that is hot needs to be insulated either through enhance the — or maintain the efficiency of the unit or to protect the crew from damage, from burns.

Q. And what materials would have been used, to your knowledge?

A. These were insulation, sometimes blankets, sometimes mud.

Q. And that would have been made out of

Page 35

what for the high temperature applications?

DEFENSE COUNSEL: Objection.

THE WITNESS: When the TURNER personnel made up mud in repairing insulation it was asbestos mixed with water.

BY MR. REICH:

Q. And did that process make dust?

A. That made some dust also.

Q. How close were you when that was being done?

A. The mixing was minor, relatively minor. And, generally, I didn't pay too much attention to it.

Q. Okay. Well, at that time did you have any knowledge about the dangers of asbestos?

A. I had no knowledge of the dangers of asbestos.

Q. Okay. In fact, did any of the equipment on the TURNER that had asbestos either in it or on it have any kind of warning labels with regard to the dangers of breathing in asbestos?

DEFENSE COUNSEL: Objection, form.

Page 36

THE WITNESS: I do not recollect any warning labels on any equipment.

BY MR. REICH:

Q. And what would you have done if you had seen warning labels that said breathing in asbestos is dangerous, wear a mask?

DEFENSE COUNSEL: Objection.

DEFENSE COUNSEL: Objection, form.

BY MR. REICH:

Q. You can answer.

MR. WEINBERG: Calls for speculation.

THE WITNESS: I answer. I would have made sure that all of us were wearing a mask.

BY MR. REICH:

Q. Is there any other equipment in the engine rooms that required asbestos that we haven't talked about yet?

MR. SKINNER: Objection, form, lack of foundation.

THE WITNESS: Electrical equipment had insulators and in that — and

Page 37

most of that was electrical equipment. This would be a phenolic plastic reinforced with asbestos.

MR. SKINNER: Move to strike, lack of foundation.

BY MR. REICH:

Q. Was it ever necessary for you to work on any of that equipment or have your men work on it in your presence?

MR. SKINNER: Objection, form.

THE WITNESS: Yes.

BY MR. REICH:

Q. And as you sit here today, do you recall any dust that was created when that electrical equipment was worked on?

MR. SKINNER: Objection, leading.

THE WITNESS: When the equipment was opened up of course there was dust. But more important I think when the phenolic molded plastic part was removed, sometimes it was difficult to remove, it had to be broken out. And I recall an instance where the plastic was broken up quite a bit.

Page 38

BY MR. REICH:

Q. Now, you also mentioned fire rooms. Can you tell the ladies and gentlemen of the jury first is there another name for a fire room? And let me start with that. Is there another name for a fire room?

A. Yes. I would say they're also called boiler rooms.

Q. How many boiler rooms or fire rooms were located on the TURNER?

A. Two. Again, one fire room or boiler room serving the engine room behind it.

Q. And can you tell the ladies and gentlemen of the jury what kind of equipment was in the fire room?

A. The fire room contained two boilers, a boiler being a furnace, reclined furnace where oil was burned to generate heat with the hot gases going through tube banks to create high pressure steam, the boiler.

Q. Okay. And was there anything on those boilers for either efficiency of the boiler and/or protection of the people who were working around it?

Page 39

A. Of course insulated

Q. Is that similar to the insulation you have described earlier?

A. I believe so.

Q. Okay. What other equipment was in the two fire rooms?

A. Pumps to deliver the oil to the furnace and blowers to force air into the furnace.

Q. Now, you were deposed or asked questions over the course of the last two days; is that correct?

A. Yes.

Q. And those questions were pretty extensive with regard to your time on the TURNER; is that correct?

A. Yes.

Q. And at that time you also were shown what we can call Plaintiff's Exhibit P-1. And I'm just going to show that to you and ask you what that is, that document?

A. This is tiled complaint Civil Action.

Q. Okay. And did that show the defendants that were sued in your case?

A. Yes.

Page 40

Q. And were you asked to do something with regard to that document?

DEFENSE COUNSEL: Objection.

THE WITNESS: Would you clarify the question, please?

MR. REICH: Yes.

BY MR. REICH:

Q. Did we send you a copy of that document at home?

A. I believe I saw it in your office.

Q. Okay. And did we ask you to —

A. And, yes, you asked me to identify people that I might know, firms that I might know.

Q. Okay. We sent you —

DEFENSE COUNSEL: Objection to the heresay.

BY MR. REICH:

Q. Did we send this to your home?

A. Yes.

Q. Okay. And at your home did you look over it?

A. Yes.

Q. Okay. Were you asked to put your

Page 41

initials next to anything?

MS. McGARRITY: Objection, form.

MR. REICH: Okay. Strike that.

BY MR. REICH:

Q. What were you asked to do with the document?

DEFENSE COUNSEL: Objection.

THE WITNESS: I was asked to put my initials next to firms that I recognized.

BY MR. REICH:

Q. And did you do that?

A. I did.

Q. After you did that were you also shown in our office what's been marked as Plaintiff Exhibit P-2?

A. Yes.

Q. And what is Exhibit P-2 made up of?

A. P-2 is made up of the description, the listing of equipment and the — originally installed on the TURNER when she was built at Bath Iron Works, Bath, Maine. So a listing of

Page 42

equipment. Also, there is a report of a, I guess it was, an in-service inspection of the engineering spaces on the TURNER, but that was before I was aboard.

Q. And did you look through that document at that time?

A. I've looked through the document.

Q. Okay. And were you asked many questions about equipment that appears in that document and what your knowledge and experience with that equipment was while you were on the TURNER?

A. Yes.

Q. Okay. Now, at some point in your time on the USS TURNER did you receive any promotion?

A. I reported aboard as main propulsion assistant. I became the engineering officer titled in the Navy engineer officer.

Q. And when did you become the engineering

Page 43

officer or engineer officer?

A. I do not recollect.

Q. Now, during the time that you were on the TURNER, were there instances where significant repair or maintenance had to be done?

A. There were, yes.

Q. Okay. And were there times where it was necessary for the TURNER to go to a shipyard or somewhere other than out on the ocean when these repairs were done? Can you tell us a little bit about that?

MR. SKINNER: Objection, form.

THE WITNESS: The TURNER had a scheduled overhaul in 19 — September, October, November through there in 1957 at the Boston Naval Shipyard.

BY MR. REICH:

Q. Okay. Do you know whether that was a scheduled service or is that something that had to be set up as a result of problems?

A. No. This was a scheduled service where the ship came to the yard with a list of items that needed repair.

Page 44

Q. Were you on the ship when it went into the Boston Navy Shipyard?

A. Yes.

Q. Were you present when those repairs or some of those repairs were done?

A. I was present when some of the repairs were done. I was present for all of what we'll call rip out of the preceding repairs.

Q. Okay. Tell us what that means.

A. Well, going to your turbine, removing the insulation and opening up the turbine for measurements and inspection if no repairs were needed.

Q. Okay. And what happened when that was done?

A. Again, when you remove insulation you get dust. You get airborne dust.

Q. Now, I think you told us that at some point during your career on the TURNER that you went to receive additional training with regard to the equipment. When did that occur?

A. The Navy sent me to the Destroyer Force Atlantic Fleet Engineering School. I left on this temporary duty in the late fall of the –

Page 45

of ’57, in other words, probably six weeks into the overhaul and returned to the TURNER on her training cruise based in — based out of Guantanamo Bay in the winter of ’58.

Q. When — about how long then would that have been if you can estimate for me?

A. I would estimate six to eight to ten weeks.

Q. When you were still on the ship and it was being prepared for this maintenance, this scheduled maintenance and repair service, who was doing the work on the ship itself? Who was handling it? Was it the ship, your shipmates or somebody else?

A. Certain work was done by the ship’s crew. The more critical work was done by the shipyard personnel.

Q. And for the time that you were on the TURNER at the Boston Navy Yard before you went to the engineering school, what were your responsibilities with regard to these maintenance and repair processes?

A. Supervising what was being done by both ship’s personnel and by the yard personnel.

Page 46

Q. And where were these repairs being conducted, what compartments on the ship?

A. The repairs were — or the engineering repairs were in the engine rooms and fire rooms.

Q. And those were the two — the four rooms that you had responsibility for on the ship?

A. Correct.

Q. After the repair in 1957 at the Boston Shipyard, was there another time while you were out on the water that it was necessary to go into a port and have some additional work done?

A. Yes.

Q. Okay. And can you tell the ladies and gentlemen of the jury what that was?

A. There are times when a ship returns to port and gets services from what's called a destroyer tender, basically a ship with machining equipment and such that you don't have on a destroyer itself.

There was a time when we were in the Sixth Fleet in the Mediterranean where we needed to get a turbine drive part

Page 47

replaced. This was actually we were docked at Monte Carlo. We couldn't machine the part. We didn't have those machining capabilities. We had arranged to have the part replaced by a machinist cutting a new part on the — on a cruiser I believe it was that was moored in Villa, France.

Q. So what had to be done to the turbine that was on the TURNER in order to get it ready for the repair and replacement of the part?

A. It had to be opened up and the part removed and a new part installed.

Q. And before it could be opened up, what had to be done on the outside?

A. I had to remove the insulation.

Q. Okay. And what happened when that insulation was removed?

A. And whenever you remove insulation you get dust.

Q. Okay. And where were you in relation to it when it was being done?

A. I was standing on top of the turbine in the cloud of dust.

Page 48

Q. So you breathed in the dust?

A. Yes.

Q. Did you get to see any of Monte Carlo when you were there?

A. No.

Q. Why is that?

A. My shipmates did, but I did not.

Q. Why didn't you?

A. I could not leave a ship with a turbine open.

Q. Was there — after the part, this new part was fabricated and installed, were you present when that happened by the way?

A. Yes.

Q. And what happened after the part, the new part was installed?

A. We operated in normal fashion.

Q. Was there anything aside from the metal that had to be replaced on the turbine?

A. Oh, you had to replace or repair or patch the insulation.

Q. And what happened when that was done?

A. The only way a ship's crew could do that is to replace insulation blankets if they were

Page 49

able to be replaced or patch them somehow or fill in the chunks, the missing spaces with what I referred to earlier as mud.

Q. And what happened when those materials were handled?

A. Well, the making of mud you're starting with a powder. When you handle the blanket, there's probably some dust released, too.

Q. And what happened with the powder when it was handled before it was mixed with the water?

A. It was dumped from a bag.

Q. And what happened?

A. There's dust.

Q. Okay. Was there another scheduled maintenance or repair period while you were assigned to the TURNER?

A. The TURNER was scheduled for what the Navy called FRAM, fleet rehabilitation and maintenance.

Q. I'm sorry. Say that again.

A. FRAM, fleet rehabilitation and maintenance.

Q. Okay. When was that scheduled?

Page 50

A. This was scheduled for Brooklyn Navy Yard, New York Naval Shipyard.

Q. What year was that?

A. 1960.

Q. When a ship like the TURNER goes in for — excuse me — goes in for a FRAM maintenance repair, what equipment is usually addressed?

A. FRAM was to update the electronics and the armament of a ship at the same time improve the efficiency of the engineering operations.

Q. Now, do you know when the TURNER was built?

A. 1945.

Q. So — and in 1960 when this FRAM process or procedure was instituted, what was the purpose generally with this FRAM, the FRAM thing?

A. As before, the purpose was to upgrade the armament and the, more important for our DDR, the electronics. But it was for engineering it was an opportunity to have shipyard work done in the engineering spaces.

Page 51

Q. And that was any repair or maintenance that was needed in addition to the general FRAM requirements?

A. Yes.

Q. Now, would it be fair to say that these FRAM procedures were instituted in order to keep the older ships in service and functioning up to, well, I was going to say up to speed, but up to technical requirements in the '60s?

A. Yes.

Q. And were you present on the TURNER when this process was done in 1960 in Brooklyn?

A. I was present on the TURNER during the planning and again during what I'll call rip out.

Q. Who in fact was involved in the planning of what work in addition to the updating of the electronics and armament would be done at the Brooklyn Shipyard?

A. As engineering officer I prepared work orders, prioritized work orders and then went with the captain, we were home ported at the time in Mayport, Florida, came to New York

Page 52

several times to negotiate the work with the New York Naval Shipyard.

Q. Okay. And, again, with regard to the rip out, you said that you were present. Approximately how long were you present during the rip out of materials in 1960 in Brooklyn?

A. I don't remember when we arrived in Brooklyn. I left the TURNER when I left the Navy in June of 1960. I was present for most all of the rip out.

Q. In the process of this rip out of the equipment and materials what happened? What, if anything, did it do to the air?

A. Well, again, if you disturb insulation you get dust from the disturbed insulation.

Q. And was that done?

A. Yes.

Q. And how close were you when you were there on the TURNER?

A. As any other maintenance procedure I was right close to the procedure and that when — that’s not a very precise answer. A couple feet.

Q. Thank you.

Page 53

A. One or two, three.

Q. When — and where are the engine rooms and fire rooms located on the TURNER? Are they above deck, below deck? What level are they on? Tell us a little bit about that.

A. They vertically extend from the bilges of the ship, the bottom of the ship to the main deck.

Q. Did there come a time when you were discharged from the Navy?

A. Yes.

Q. And when was that, sir?

A. That was in June of 1960.

Q. Was that an honorable discharge?

A. Yes.

Q. Where did you go to work after you left the Navy?

A. The Rohm & Haas Company in Philadelphia.

Q. What was your job at Rohm & Haas? What were you hired to do?

A. I was hired to do technical marketing for Rohm & Hass's Plexiglas brand methyl methacrylate sheet.

Q. And tell us a little bit more. When you

Page 54

say marketing for that product, what were you doing as technical marketer or marketing?

A. Searching for new markets for this material which was originally used in World War II aircraft. In peacetime uses had evolved to the internally illuminated sign, but with the passage greater than the sign industry, we looked for building type applications. The dome skylight would be one that I worked with.

Q. How many years did you work at Rohm & Haas?

A. I've lost track of how many years. I, of course, progressed into other products, other roles, but all of my work at Rohm & Haas was in what we'll call technical marketing or commercial development.

Q. And do you recall when you left Rohm & Haas?

A. Not without the benefit of notes.

Q. Okay. Was it approximately 1992?

A. Yes.

Q. And when you left Rohm & Haas, were you also involved in any other kind of business or

Page 55

work?

A. I had — I consulted in the chemical industry, plastics industry and had several businesses involved in insulation of metal buildings utilizing fiberglass.

Q. And was this with the approval of Rohm & Haas? They knew about it and they accepted that?

A. Well, in fact, before I left Rohm & Haas, I had an employment contract modified to allow me to consult in any area I wished except something that would conflict with my primary Rohm & Haas job.

Q. Was one of the responsibilities that you had or one of the consulting jobs related to a product that at one point was Rohm & Haas's product or a division that they either sold off or divested themselves of?

A. I divested or two of us divested a business. And the buyer of the business needed a lot of help on the business side, not necessarily the plastic compounding side, and that was, of course, why Rohm & Haas allowed me to negotiate such an employment contract

Page 56

rather unique in industry.

Q. In fact, you were helping Rohm & Haas make this sale a successful one by assisting the purchaser in being able to make this a successful business; is that right?

A. Yes.

Q. Now, when you left, to the best of your knowledge, was there any exposure to asbestos at Rohm & Haas?

A. I was located in marketing offices, headquarters offices.

Q. So to the best of your knowledge —

A. To the best of my knowledge —

Q. —there was no exposure to asbestos?

A. No real exposure to asbestos.

Q. Was there any exposure that you know of? There was none that you know of at Rohm & Haas?

A. I did get into Rohm & Haas plants for a variety of meetings and such, so I did get into the Bristol plant for example.

Q. Okay. But just for meetings?

A. Most all were for meetings.

Q. Okay. And you were in meeting rooms at

Page 57

those plants?

A. Yes.

Q. With regard to after you left Rohm & Haas, what if anything else were you doing?

A. Well, I mentioned earlier that I expanded the consulting and ended up with three companies involved in the insulating, insulating metal buildings.

Q. And was there any asbestos exposure involved in any of that?

A. Absolutely no asbestos involved in that, that insulating process.

Q. Are you involved today in anything that's close to your heart that you do?

A. I still do a limited amount of consulting. Really it's more as a manufacturer's rep in one — for one client in the flame retardant industry. Over the years I've become quite knowledgeable in flame retardant chemistry. This client has a system that is an effective flame retardant, unlike others is environmentally friendly, unfortunately not easy to use.

So my challenge in life right

Page 58

now is to try and save some lives without screwing up the environment.

Q. The other — were you involved in any of the actual hands-on chemical mixing and making of these products yourself?

A. Which products before I answer?

Q. Okay. I mean, with regard to the fire retardants and —

A. I never was involved in hands-on bench work or other — with flame retardants of any sort.

Q. Okay. And why is it important to you to continue the work with regard to this particular kind of flame retardant?

A. Well, as I said, flame retardants have a — have many bad environmental consequences. And this particular one is environmentally friendly. It can replace those with bad environmental consequences on certain occasions.

Q. Okay. Over the years have you developed any hobbies or interests?

A. I have been a fisherman most of my life. When my body slowed down, my with and I both

Page 59

had to stop playing tennis. So I've tried to learn how to play golf.

Q. And what are some of the activities you would do with your wife?

A. Well, we would sometimes play tennis or golf together, but more we also traveled fairly extensively.

Q. Have you ever smoked cigarettes or —

A. I never smoked a cigarette.

Q. Okay. And were you ever a smoker of any other kind of tobacco product?

A. I think I tried a pipe once — about one hour in college days. And it was just too much work.

Q. What was your general health before 2012?

A. I've been blessed with good health, no health issues at all, no life threatening health issues at all, no life-threatening health issues at all before 2012.

Q. And what happened in 2012 that may have changed that?

A. I was diagnosed with lung cancer.

Q. Can you tell the ladies and gentlemen of the jury, please, the process that led to that

Page 60

diagnosis? What were you experiencing that led you to get medical treatment or care?

A. In the winter of like February, March 2012, I was expecting shortness of breath, headaches, primary care physician couldn't see any reasonable causes, referred me to several specialists. One was a pulmonologist. This was for two reasons. One because I was short of breath, but also because the primary care physician and my wife have said that I've had sleep apnea for years. And the pulmonologist was — did sleep studies as well as checking breathing.

Q. Was that Doctor Friedenheim?

A. Doctor Richard Friedenheim.

Q. And where was that? What hospital is he affiliated with?

A. He's affiliated with Abington Memorial Hospital.

Q. And what did Doctor Friedenheim do to determine the cause of your shortness of breath?

A. Well, he identified fluid, removed the fluid.

Page 61

Q. How did he go about removing that fluid?

A. Whatever they call it, a needle between the ribs and drained fluid by gravity.

Q. And how did that feel when that was done?

A. My lung — of course, you're removing a fair volume of material from the lung. The lung will normally reinflate quite easily. My lungs didn't want to reinflate very easily. It was rather painful for a period, a short period of time.

Q. Do you remember approximately how much fluid was removed from your lung at that time or from around your lung?

A. Well, it was over 600 cc's. The number I heard was 600 cc's. but Doctor Friedenheim had a somewhat higher number.

Q. Is that — in relation to something that we would understand, how does that relate, say to a quart? Was it a little bit less than a quart?

A. Yeah. Probably about a quart, a little less than a quart.

Q. Okay. Now, were any tests done on this

* * *

Page 82

deposition will continue.

MR. REICH: Well, to the extent that any materials, medical records — certainly we don't have medical records. We're doing this deposition quickly because we don't know how Mr. DeVries is going to react to the chemotherapy and the treatments that he has. And we're attempting to preserve his testimony.

Certainly the medical records will be made available to the extent as quickly and as fully as we can all get them from the hospitals. Mr. DeVries has signed various HIPAA authorizations. My understanding is that they're out there. And as sooon as those records are available they'll be available to us.

MR. KATTNER: All right. And subject to the production of those records this deposition will remain open, will not be closed and can be continued subject only to scheduling upon receipt of those records.

MR. REICH: I don't agree to anything with regard to that. You can make

Page 83

your motions to do whatever you feel you need to do.

MR. KATTNER: Of course, there's no need for a separate motion, but we're just stating this for the record so it's clear.

MR. REICH: Like I said, I don’t necessarily agree with that.

Okay. We can go back on the video. I feel this has been full and thorough and anything else is really not necessary.

MR. KATTNER: But you have not yourself obtained or produced the radon records or the military records he says that he has in his possession.

MR. REICH: No. He's not an expert, so he's not going to be the one testifying about that stuff anyway. You asked him about it. It's on the record. Whatever is obtained will be made available obviously.

I'm sure you're going to show it to people. We're going to show it to people. We're going to show it to people. Trying to question him more about them I don't think is going to be productive

Page 84

for anybody. But I understand what you are saying. Let's go back on the video, please.

THE VIDEOTAPE OPERATOR: The time is 11:51. We're back on the video record.

BY MR. KATTNER:

Q. Mr. DeVries, I understand you lived a number of years at 1260 Gravel Hill Road, Southampton, PA; is that correct?

A. Yes.

Q. And the zip code there was 18966?

A. Yes.

Q. And I think you were there somewhere around 20 years at least from the time of your retirement or moving out of Rohm & Haas through a sale of that property somewhere around 2011; correct?

A. Sold the property in 2011 and was there at least 20 years by your count.

Q. And you had some radon tests performed yourself in connection with the sale; correct?

A. In preparation for the sale of the property we had radon test performed and had a home inspection performed.

Page 85

Q. And the seller also had a home inspection performed that involved, among other things, radon; correct?

A. Yes.

Q. And I understand that your testimony was that the selling price was reduced as a result of those radon tests disputes by some amount?

A. I understood that from the realtor.

Q. And I take it you — all right. Now, sir, when you were on the U.S. Navy ship the USS TURNER you were a Naval officer at all times; correct?

A. Yes.

Q. And it's your understanding as reflected in the 1945 documents is that the exhibit I think one or two is, among other things, that that ship had been built in strict accordance with Navy specifications; is that correct?

A. Will you restate that question, please?

Q. Sure. If I could have the copy of the exhibit? I apologize. Your understanding as a Naval officer that, among other things, as reflected in this DeVries Exhibit 2 is that it was reported the machinery of the subject.

Page 86

vessel including engines, boilers, appurtenances, spare parts is strong and well built and in strict accordance with the drawings, specifications and duly authorized changes therein except for those listed on the work list cards furnished by the Board as per this document which is titled From Office of Supervisor of Shipbuilding U.S. Navy, Bath, Maine, June 1945?

MR. REICH: Okay. I'll object. Can we go off the record, please?

THE VIDEOTAPE OPERATOR: The time is 11:54. We're going off the video record.

MR. REICH: Number one I object because he has no personal knowledge of that. Number two I object because even in what you read it said that except for various cards that we don't have that he hasn't seen, so I guess it wasn't completely built in accord with the specs if there are cards that indicate otherwise.

But I don't think he's the right witness to answer that question. He

Page 87

doesn't have that knowledge. And I object to it for that reason.

MR. KATTNER: Okay.

THE VIDEOTAPE OPERATOR: The time is 11:55. We are back on the video record.

BY MR. KATTNER:

Q. And, Mr. DeVries, I think you testified that you were a midshipman in the Navy ROTC some time between 1952 and 1957 at Cornell; correct?

A. Yes.

Q. And you were trained through that Navy ROTC program in, among other things, Naval science; is that correct?

A. Yes.

Q. And your testimony was that you do not recall seeing the Navy Bluejacket's Manual?

A. Do not recall seeing a Navy Bluejacket's Manual.

Q. And whether you were instructed in accordance with it one way or another it's not something that you recall as of this time; is that correct?

Page 88

A. It's unlikely I would have seen a Bluejacket's Manual because that was given to I understand enlisted people.

Q. I see. Were you ever told that as a potential officer or division officer it would be your duty to instruct the men in appropriate safety precautions?

A. As a generality, yes.

Q. And were you ever instructed that the Navy had a safety precaution's department?

A. No.

Q. You were however instructed according to the Navy way, correct, the right way, the wrong way or the Navy way?

A. Yes.

Q. Okay. And, sir, at all times you were on the USS TURNER as you have mentioned you were a Naval officer; correct?

A. Yes.

Q. And after your first few months there, as you have testified, you went away to what you called the destroyer school to get further training from the Navy; correct?

A. Yes.

Page 89

Q. What was the name of that school again?

A. As I best remember, Destroyer Force Atlantic Fleet Engineering Officer's School or something of that sort.

Q. Okay. And to the extent you received more specific instruction about the equipment on the ship, did you have an opportunity to review the Navy specifications for turbines or other machinery on the ship?

A. I don't recollect any review.

Q. Were you aware that Navy regulations, at least from 1953 or other times, stated that the insulation of lagging on the machinery equipment would be furnished by the shipbuilder?

MR. REICH: Objection.

BY MR. KATTNER:

Q. Were you aware of that from your training?

A. I was neither aware of it nor was I dealing ever with the shipbuilder.

Q. Okay.

MR. REICH: Move to strike.

BY MR. KATTNER:

Page 90

Q. Sir, during your time on the ship, you agree that there were lots and lots of pipes throughout the ship; correct?

A. There were pipes.

Q. And there were many insulated parts of the ship; correct?

MS. McGARRITY: Objection, form.

THE WITNESS: What kind of parts?

MR. KATTNER: Machinery, pipes.

THE WITNESS: Pipes and the machinery that we've discussed in the engineering spaces were insulated when the fluid inside was hot.

BY MR. KATTNER:

Q. And your responsibilities, as you have described earlier in your deposition, were throughout the engineering spaces of the ship; correct?

A. Yes.

Q. And your — you were in the aft of officers' berthing area in the ship?

Page 91

A. Yes.

Q. Did you also take meals with the other officers in the wardroom?

A. Forward wardroom, yes.

Q. And among the parts of the Engineering Department that were your responsibility included the engineering office? Did you serve time there?

A. I guess they would call it engineering office, but it was basically my stateroom.

Q. Okay. And then there was the forward and the aft fire rooms; correct?

A. Yes.

Q. And there was also the forward and the aft engine room?

A. Yes.

Q. And these — the fire rooms had an upper level and a lower level; correct?

A. I don't recollect how they were configured.

Q. I see. But they had various levels that are —

A. They were — yes.

Q. Okay. So sailors could be walking at

Page 92

one level or a different level depending on what their function was?

A. Yes.

Q. And as the officer you visited each of those levels at different times?

A. I was in those fire rooms and engine rooms almost continuously.

Q. And in addition to a specific piece of machinery, there was quite a bit of insulated piping in each of those fire rooms and engine rooms; correct?

MS. McGARRITY: Objection, form.

THE WITNESS: There was insulated piping, yes.

BY MR. KATTNER:

Q. And I think you — we examined that you personally did not know the manufacturing of the insulation on the material on the ship, did you?

A. Please restate it.

Q. Okay.

A. I think there was a double negative there.

Page 93

Q. I will restate the question. Thank you, sir. As far as who supplied the insulation that was present on the ship when you first joined it, who manufactured the insulation on the outside of the machinery, you personally don't know who had manufactured that?

A. I do not know the manufacturer.

Q. Nor did you — you know from records that there had been some prior overhauls and inspections on various pieces of machinery on the ship; correct?

A. Yes.

Q. And with respect to whatever was ripped out and replaced as the insulation on those prior visits you personally don't know what they were?

A. Yes.

Q. And during the time you were at the ship, for instance, you mentioned the Boston rip out of insulation, you went to engineering school or the destroyer school. When you came back the insulation had already been replaced; correct?

A. Yes. Yes.

Page 94

Q. But you don't know from what manufacturer had supplied the replacement insulation?

A. I do not know the manufacturer of the insulation.

Q. All right, sir. And at this time I understand your treatment is still ongoing?

A. It will be ongoing the rest of my life.

MR. KATTNER: Okay. And subject to the earlier comments, I'm going to pass you either to another counsel or thank you for your time today.

THE VIDEOTAPE OPERATOR: The time is 12:02. We're going off the video record.

– – –

(Whereupon, a discussion was held off the record.)

– – –

THE VIDEOTAPE OPERATOR: The time is 12:03. We're back on the video record.

– – –

EXAMINATION

Page 95

– – –

BY MR. WEINBERG:

Q. Good morning, sir. David Weinberg. We met the other day. I just have a few follow-up questions for you. Now, you told us you joined the Navy in June of 1957. That's when you were assigned to the USS TURNER; right?

A. More properly I joined the Navy when I became a midshipman.

Q. Okay. But you actually became active duty in June of 1957 and went to the USS TURNER; right?

A. When I reported aboard the TURNER, yes, sir.

Q. And about three or four months after you reported that ship was sent to the Boston Navy Yard for an overhaul; right?

A. It was sent to the Navy Yard in the late fall, winter.

Q. Okay. And after about three or four weeks of — in that overhaul you were sent to engineering school; correct?

A. I think it was more than three or

Page 96

four weeks, but, yes, I went to engineering school.

Q. And during the time that you were there at the Boston Naval Yard during that overhaul on the USS TURNER they were removing the insulation from the ship; is that right?

A. Yes.

MR. REICH: I'm going to object only because we don't know how much. The question is unclear, seems to indicate all of it was removed or some of it. I don't know.

BY MR. WEINBERG:

Q. Okay. As far as the engineering spaces that you were in charge of the insulation and lagging was removed out of those spaces; isn't that correct?

A. I do not recollect the — what I recollect is removal of insulation from individual, specific units.

Q. Okay. And when we talk about insulation we're talking about the pipe covering or those half moons that go on the pipe; isn't that correct? That's one of the parts of

Page 97

insulation?

MS. McGARRITY: Objection, form.

THE WITNESS: But I have not discussed the pipe cover.

BY MR. WEINBERG:

Q. What is that, sir?

A. I've not discussed pipe covering.

Q. Okay. But that's what we're talking about when we're talking about insulation. The pipe covering that goes around the pipes that's one aspect in insulation; isn't that right?

MS. McGARRITY: Objection, form.

BY MR. WEINBERG:

Q. You can answer, sir.

A. That's one use of insulation.

Q. Right. And another one is the cement product, like a mud that goes — that's applied or troweled onto different equipment or around elbows around piping; isn't that right?

A. Yes.

Page 98

Q. All right. And you also have blankets that were used as insulation products; right?

A. On certain pieces of equipment, yes.

Q. Okay. And those were the products that were being removed during that overhaul in Boston in 1957; right?

MS. McGARRITY: Objection, form.

MR. REICH: Objection. It's a compound question. Which one was being removed?

MR. WEINBERG: All of them. That's if he can answer that and then I'll break it up if you can't.

BY MR. WEINBERG:

Q. Were all those type of products being — the type of products being removed during that overhaul in Boston in 1957?

MS. MCGARRITY: Objection, form.

THE WITNESS: I don't recollect which units were worked on at Boston.

BY MR. WEINBERG:

Page 99

Q. Okay. You also talked about an overhaul in Brooklyn in 1960. Was that the type of work that was being done in Brooklyn as well where they were removing insulation and lagging from equipment and piping during that time period on the USS TURNER?

MS. McGARRITY: Objection, form.

THE WITNESS: Similar removal.

BY MR. WEINBERG:

Q. And when they were removing the insulation and lagging from the products, from the equipment in Brooklyn in 1960, did that create dust?

MS. MCGARRITY: Objection, form.

THE WITNESS: Whenever you disturbed insulation on equipment you create dust.

BY MR. WEINBERG:

Q. Okay. And did you breathe that dust, sir?

MS. McGARRITY: Objection, calls for speculation.

Page 100

THE WITNESS: Yes.

BY MR. WEINBERG:

Q. And the same with the Boston Navy Yard in 1957, when they did that overhaul, did that create dust when they were removing that insulation before you left for engineering school?

MS. McGARRITY: Objection, form.

THE WITNESS: As before, whenever you remove insulation, disrupt insulation, at least in the types of insulation used in those days, you created dust.

BY MR. WEINBERG:

Q. And did you breathe that dust that was created?

MS. McGARRITY: Objection, calls for speculation.

THE WITNESS: Yes.

BY MR. WEINBERG:

Q. All right, sir. Now, one of the things I want to ask you about is when you were talking about the work, when Mr. Reich, your

Page 101

attorney was asking you questions that was being done on some of the equipment, it was your job to supervise that work; correct?

A. It was my job to make sure it was done right.

Q. Okay. And my term was supervising and your term is to be done right. Is it the same thing?

A. I think sometimes we go a little farther with our own hands than just standing and looking.

Q. Okay. But you're observing others doing this work on the equipment; correct?

A. Others were assigned to do the work.

Q. Right. All right. Now, I want to switch gears with your, sir. And I know you have told us you have gone to two different oncologists. Have either of those oncologists ever told you that your lung cancer is related to asbestos exposure?

A. I have been so told.

Q. And who has told you that?

A. Neither of the oncologists.

Q. Okay. Well, my question was, did either

* * *

JOHN B. DeVRIES

* * *

Page 68

personal mechanical work on any of the equipment aboard the ship as an engineer officer?

A. I worked with our people.

Q. But was your work limited to supervision?

A. It was supposed to be.

Q. Were there occasions when you actually had to perform work yourself on the equipment?

A. I had to show people how to.

Q. Now, the USS TURNER, it's my understanding that that ship was built in 1945. Are you aware of that?

A. At the Bath Iron Works.

Q. And at the time of construction that would be the point in time when all the pipe lines would be installed on the ship; is that correct?

A. I believe so.

Q. At the time of construction that would be the time when the equipment was installed aboard the ship; is that correct?

A. I believe so.

Q. Would you have any knowledge of any of

* * *

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

DONNA L. HAGEN, Individually and as Executrix of the Estate of MALCOLM HAGEN	:	
Plaintiff,	:	**CIVIL ACTION NO. 2:07-cv-63346**
VS.	:	
FOSTER WHEELER ENERGY CORPORATION and GENERAL ELECTRIC COMPANY, et al.	:	
Defendants.	:	

AFFIDAVIT OF THOMAS F. MCCAFFERY IN SUPPORT OF FOSTER WHEELER ENERGY CORPORATION AND GENERAL ELECTRIC COMPANY'S LEAVE TO FILE SUPPLEMENTAL BRIEFING AFTER ORAL ARGUMENTS

I, Thomas F. McCaffery, being duly sworn, deposes and says:

1. I am currently a Commander in the United States Naval Reserves, and have been an officer since 1976. I have served active duty on a variety of cruiser and destroyer type ships·assigned to the U.S. Atlantic and Pacific Fleets. My performance was recognized

by four personal awards and being recalled, by name, twice during the Persian Gulf War of 1990/91. I also served aboard U.S. Merchant Marine vessels. I graduated from the U.S. Merchant Marine Academy in 1976 with a B.S. in Marine Transportation and Management, and also graduated from the U.S. Naval War College, College of Command and Staff in 1991. I am also a technical consultant, naval researcher, naval historian and head of a company that specializes in U.S. Navy and merchant marine ship design, development, construction, maintenance and repair records, as well as Navy/Military specification, qualified products lists and related records.

2. Based on my experience, training, education, and research, I am personally familiar with the U.S. Navy's approach to Safety and Industrial Hygiene from the 1930s to present. Throughout this period, the U.S. Navy always viewed Safety Precautions (accident prevention to avoid personal injury or loss of life) separately from Industrial Hygiene (prevention of long and short-term industrial diseases). In fact, to this day, the U.S. Navy continues to have separate commands that are charged with Navy-wide responsibility for Safety Precautions (Naval Safety Center) and Industrial Hygiene (Navy & Marine Corps Public Health Center). Those commands are so separate that they don't even report to same command; the Naval Safety Center reports directly to the Chief of Naval Operations, whereas the Navy & Marine Corps Public Health Center reports to the Surgeon General of the Navy (Bureau of Medicine and Surgery). To that end, the U.S. Navy considers Safety Precautions to be a line management function, which involves accident prevention to avoid personal injury or loss of life,

whereas Industrial Hygiene is a medical function, which involves prevention of long and short-term industrial diseases caused by exposure to toxic or hazardous materials. The U.S. Navy did not consider, based on its own research and investigations (e.g., "A Health Survey of Pipe Covering Operations in Constructing Naval Vessels," 1946, by W.E. Fleischer, F.J. Viles, Jr., R.L. Gade and P. Drinker) asbestos-containing materials, as used on Navy ships, to be sufficiently hazardous or toxic, to require warning labels until after 1970 (e.g., U.S. Navy Bureau of Medicine and Surgery Instruction 6260.14, "Asbestos; Measures for Control of").

3. Machinery for U.S. Navy ships, such as that manufactured by Foster Wheeler and General Electric, was purchased by the U.S. Navy either directly or through a shipbuilder which had been awarded a prime contract to build one or more ships for the U.S. Navy. Procurement of machinery by shipyards, such as New York Shipbuilding Corporation, for the construction, conversion or repair of U.S. Navy ships was subject to U.S. Navy requirements for contracts just as if the contract were between the manufacturer and the U.S. Navy and not the shipyard. The Navy's contract terms covered every aspect of the machinery procurement process from initial design and plans through manufacturing, inspection, and the machinery's shipment to the shipyard. One of the specific contractual requirements was for manufacturers to write an approved technical manual for the machinery. To that end, the Navy, starting in 1945, issued precise specifications for the content and format of instruction books or technical manuals.

4. The design for the USS Kitty Hawk began years before its keel was laid on December 27, 1956. Thus, the Military Specification for Technical Manuals for Mechanical and Electric Equipment that governed Foster Wheeler and General Electric's original equipment supplied to that vessel was the August 16, 1954 MIL-T-15071B unless the purchase order or contract for the machinery was amended after September 10, 1957 to require compliance with MIL-T-15071C. I am also informed that plaintiff Malcolm Hagen alleged to have worked on or around the USS Kitty Hawk from sometime in 1958 to sometime in 1961. Accordingly, I will also discuss the Military Specifications for Technical Manuals for Mechanical and Electrical Equipment that were in effect during the 1958 to 1961 period for completeness and context only.

5. In the manuals which the manufacturers were obligated to provide under their contract or purchase order, the U.S. Navy required equipment manufacturers to provide operating and maintenance instructions specific to their products which the U.S. Navy purchased. The Military Specification for Technical Manuals for Mechanical and Electric Equipment in effect from August 16, 1954 to September 10, 1957 (MIL-T-15071B) provides that an equipment manufacture's technical manual shall contain a safety notice "where high voltages or special hazards are involved." *See*, 3.5.1.1. That section directs us to "see figure 9." Figure 9 is the last page of that technical manual, which provides those circumstances representing high voltages or special hazards, all of which relate to accident prevention to avoid immediate and certain personal injury or loss of life and/or damage or destruction of

the equipment. Nothing contained within figure 9 remotely pertains to the prevention of long and short-term industrial diseases caused by exposure to toxic or hazardous materials.

6. The next two editions of the Military Specification for Technical Manuals for Mechanical and Electric Equipment (MIL M-15071C in effect from September 10, 1957 to June 6, 1961 and MIL-M-15071D effective June 6, 1961) remove the provision requiring a safety notice where high voltages or special hazards are involved. In its place, the U.S. Navy distinguishes between those activities that "will" damage or destroy the equipment versus those activities that "will" result in immediate and certain personal injury or death:

> **3.3.3.2 Emphasis**. - *When necessary*, emphatics such as "NOTE", "CAUTION", and "WARNING" shall be used as adjuncts to the text. These, however, *shall be used as sparingly as is consistent with the real need*. The appropriate adjunct to the text shall be selected in accordance with the following definition:
>
> > (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 <u>will result in personal injury or loss of life</u> if not correctly followed.

See, MIL-T-15071C - September 10, 1957 (*emphasis* added).

> 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.

See, MIL-T-15071D - June 6, 1961 (*emphasis* added).

7. Under the 1957 and 1961 versions MIL-T-15071, the text of any warning "shall be factual." *See*, MIL-T-15071C, Section 3.3.3.1 - September 10, 1957; *see also*, MIL-T-15071D, Section 3.3.1 - June 6, 1961. Accordingly, any "Warning" had to meet a three-part test. First, it had to be "factual" in that it was always a true statement. Second, the Navy must have agreed that a "real need" for the warning existed. Third, the warning must address operating procedures or practices that "will result" in immediate and certain personal injury or death every time that procedure or practice is "not correctly followed." Given the fact that not everyone who is exposed to asbestos suffers an as-

bestos-related disease, a warning pertaining to a minute and speculative long-term disease that may or may not occur 15 to 40 years in the future was not permitted under this three-part test.

8. In analyzing the U.S. Navy's hazard communication program as exemplified in the 1954, 1957 and 1961 versions of MIL-T-15071, it is clear that the U.S. Navy required reasonably precise specifications pertaining to cautions and warnings in that any caution or warning supplied by an equipment manufacturer had to describe an operating practice or procedure that "will result" in **immediate** and **certain** personal injury, loss of life, damage to equipment or destruction of equipment. It was not until after 1970 that the U.S. Navy considered asbestos-containing materials to be sufficiently hazardous or toxic, as used on Navy ships, to require warning labels.

By: s/Thomas F. McCaffery
Thomas F. McCaffery

Sworn and subscribed to before me
this 17th day of December, 2009
s/Ralph Hammock
Ralph Hammock
Notary Public
Commonwealth of Virginia
My Commission Expires April 30, 2010
Commission ID# 266451

JOHN B. DeVRIES	:	COURT OF COMMON
and	:	PLEAS
ROBERTA G.	:	PHILADELPHIA COUNTY
DeVRIES,	:	
h/w	:	
Plaintiffs	:	DECEMBER TERM, 2012
	:	
vs.	:	
	:	NO. 3661
ALLEN-BRADLEY	:	
COMPANY, et al.		ASBESTOS CASE
Defendants		

— — —

TUESDAY, JANUARY 15, 2013

— — —

Videotaped Discovery

Deposition of JOHN B. DeVRIES, taken pursuant to notice, held at the offices of Veritext National Court Reporting Company, 1801 Market Street, Suite 1800, Philadelphia, Pennsylvania on the above date, beginning at or about 10:10 a.m., before Kathleen Woods Logue, Professional Reporter and Notary Public there being present.

— — —

VERITEXT NATIONAL COURT REPORTING COMPANY
MID-ATLANTIC REGION
1801 Market Street — Suite 1800
Philadelphia, Pennsylvania 19103

JOHN B. DeVRIES

* * *

Page 258

to any Bell & Gossett equipment?

A. Yes.

Q. Okay. Now, I want to focus your attention on the Foster Wheeler condensers on board the TURNER. Can you tell me where these condensers were located?

A. In the engine room.

Q. And I believe there were two of them?

A. Yes.

Q. Okay. You don't recall any other Foster Wheeler equipment on board the TURNER; correct?

A. Correct.

Q. Okay. Now, there were two engine rooms. Does that mean there was one condenser in each room?

A. There actually were two condensers in each engine room. One was sort of an auxiliary, so —

Q. So there were —

A. One Foster Wheeler condenser in each engine room.

Q. Okay. And then there was one auxiliary condenser to go with that?

Page 259

A. Yes.

Q. And those auxiliary condensers were not manufactured by Foster Wheeler; correct?

A. I refer to the data you've been given.

Q. Well, you know, we can look at that. I believe I can direct your attention to — well, I guess it's not numbered, the page, but under part Roman Numeral IV in Plaintiff's Exhibit 2.

MR. REICH: Let's go off the video record —

MR. MASTROIANNI: Sure.

MR. REICH: — while we find that.

THE VIDEOTAPE OPERATOR: The time is 4:12. We're going off the video record.

MR. MASTROIANNI: It's towards the end. It's Roman Number IV. There's a heading on top, Machinery Installation. Do you see it?

MR. REICH: No. I must be missing it. Mine goes from three to six.

THE WITNESS: I think it's six

Page 260

he means.

MR. MASTROIANNI: Roman Number IV.

THE WITNESS: I have Roman Numeral VI here that's relevant.

MR. MASTROIANNI: Oh, sorry. Roman Number VI. I'm dyslexic. So I switched the V and the I.

MR. WEINBERG: It says machinery installation?

MR. MASTROIANNI: Yes.

THE VIDEOTAPE OPERATOR: The time is 4:13. We're back on the video record.

BY MR. MASTROIANNI:

Q. Okay, sir. So you'll notice paragraph F?

A. Yes.

Q. If you read along with me it just says, Main condensers consists of two single pass condensers manufactured by Foster Wheeler Corporation.

So as you stated before to the extent that your recollection is consistent with these records you can only recall two

Page 261

Foster Wheeler condensers on board the TURNER; correct?

A. I recall two Foster Wheeler condensers and two Worthington condensers.

Q. Worthington. And those were the auxiliary condensers?

A. And those were the auxiliaries as listed here.

Q. Are you able to tell me the purpose of the Foster Wheeler condensers?

A. Well, your main condenser took the spent steam from the turbine and cooled it to water and then recycled through pumps to the boiler.

Q. Can you describe the size of one of these main condensers for me and the shape?

A. It looked like a big sea cow, a manatee. The headers of the condenser were big enough for two or three men to get into, to give you a — an assessment of size.

Q. And they were shaped like a manatee, so —

A. I just — a big, bulky —

Q. Were they cylindrical in shape like —

A. Horizontal.

* * *

Page 266

this afternoon you talked at great length with Mr. Stokes about the nature of the repair and maintenance work that you would oversee. You didn't discuss anything pertaining to these condensers per se.

Do you recall any kind of maintenance or repair work being done by any of the seamen that you oversaw with respect to the Foster Wheeler condenser?

MR. REICH: This is any time that he's on the ship?

MR. MASTROIANNI: Correct. Now we're talking about any time.

THE WITNESS: I recall vividly salt water contamination of the condensate in the condenser. This came from leaks in condenser tubes.

BY MR. MASTROIANNI:

Q. Do you recall what year that was, a time period maybe?

A. This was at sea. I am uncertain. Probably 1959. You can cross-reference my date with the landing of the first Mercury capsule because we were the recovery ship.

Page 267

And the capsule was 500 miles off range.

Q. Are we talking about the moon?

A. It was the first attempt to shoot a rocket up.

Q. Oh, okay.

A. This was just a piece of sheet metal.

Q. Oh, landing coming down. Okay. Sorry.

A. Mercury is too far back for your memory.

Q. Yeah. I'd say that's a fair statement. Now, with respect to this salt water contamination, this I think you said was a result of a leak in the tubes inside the condenser?

A. Tube leaks, yes.

Q. And this allowed for salt water to get inside.

A. Yes.

Q. All right. This happened I'm assuming with only — with respect to only one of the condensers; correct?

A. Yes.

Q. Okay. And are you able to tell me the nature of the repair work that you had to do with respect to this one condenser in order to

* * *

Page 270

of importance. Is that a fair statement?

A. Yes. It was actually the captain and myself.

Q. Now, backing up the damage control that you guys would essentially do to the tubes that were leaking on this condenser, are you able to estimate for me approximately how long it took for you to identify the one leaking tube and then plug that tube start to finish?

A. No. Recognize also it wasn't just one leaking tube, there were several, probably several dozen.

Q Did it take more than a day or a week?

A. It took several days.

Q. Okay. Now all the while you are doing this work, are you giving orders or are you essentially receiving orders and then distributing — redistributing those orders, receiving from a superior officer I should say?

A. First there's no superior over me as engineer officer and relating to the engineering spaces. I advised, showed, helped

Page 271

the people doing the search for leaks. And at one stage I spent about six hours in that header myself.

Q. And is that the time you mentioned earlier when you said you yourself went inside one of these headers?

A: Yeah.

Q. Okay. So you went inside a header just on one occasion to look for leaks?

A. I was in it several times, but I—

Q. How did you know what needed to be done to the condenser?

A. A high pressure marine boiler can't have contaminants in the water. We had an instrument that measured the salinity and we saw the salinity creeping up. We knew we reached a point where we'd have to shut that engine down.

Q. And you had background knowledge of this type of potential problem from your studies at Cornell or —

A. No. From the Destroyer Force Engineering School.

Q. Okay. So that brief period after –

Page 272

when the ship was dry docked and you went to that school?

A. No. This is the second — we're talking now the second shipyard overhaul.

Q. Right.

A. Not the first one.

Q. And it was during that time period where you were in engineering school that you acquired that knowledge how to look for problems, identify a problem and determine what needed to be done?

A. We were taught how to run those plants.

Q. Okay,

MR. REICH: How many weeks was that course, approximate?

THE WITNESS: I recollect it was like eight or ten weeks. It could have been plus or minus two.

BY MR. MASTROIANNI:

Q. Did you ever — well, strike that. Were there any manuals that accompanied these condensers?

A. Yes.

Q. Okay. And did you yourself have

Page 273

occasion to review those manuals?

A. On occasion.

Q. Okay. Did you review those manuals with respect to the contaminated salt water problem?

A. Of course,

Q. Okay. And that provided you with some kind of direction in terms of what needed to be done to prevent any further damage?

A. Yes. But — yes.

Q. Okay. Were those manuals procured or supplied by the Navy or were they directly from Foster Wheeler?

A. They were from Foster Wheeler through the Navy. Presumably, the supply contract involved not just spare parts but also manuals.

Q. So the manuals you knew they were from Foster Wheeler how?

A. Foster Wheeler's-name on them.

Q. Okay. Was it then just a name or was it like a logo, something more distinct?

A. Name, logo, whatever would have been put on by Foster Wheeler.

* * *

Page276

MR. MASTROIANNI: Thank you.

BY MR. MASTROIANNI:

Q. Mr. DeVries, as you sit here today, do you know whether you were exposed to any asbestos in relation to the work that you and your crew that you oversaw performed with respect to the contaminated salt water issue on the one Foster Wheeler condenser?

A. No.

Q. Do you believe that you were exposed to asbestos at all in relation to either or both of the Foster Wheeler condensers on board the TURNER?

A. I don't recollect instances that I would have been.

MR. MASTROIANNI: Okay, sir. Those are all the questions I have for now. Thank you.

- - -

EXAMINATION

- - -

BY MR. REICH

Q. This Foster Wheeler — these Foster Wheeler condensers, would it be fair to say

Page 277

that it was pretty hot temperature material that flowed through them?

A. Dispense steam, yes.

Q. Okay. And do you know whether the condenser had any — these condensers had any gaskets in them?

MR. MASTROIANNI: Objection.

BY MR. REICH:

Q. Or seals?

MR. MASTROIANNI: Objection.

THE WITNESS: The connections had to have seals.

MR. REICH: Okay.

THE WITNESS: Like gasket seals. The manhole that we climbed in had to have gasket seals.

BY MR. REICH:

Q. Okay. And to your knowledge from your training what would those seals have been made from?

MR. MASTROIANNI: Objection.

THE WITNESS: I —

BY MR. REICH:

Q. From your training.

Page 278

A. From training I would have said asbestos composite.

MR. MASTROIANNI: Move to strike, calls for speculation, speculative portions.

BY MR. REICH:

Q. Would it have been necessary for those seals or gaskets to be disturbed in any way while you were on the TURNER in the presence of these condensers?

MR. MASTROIANNI: Objection, calls for speculation.

BY MR. REICH:

Q. Do you understand the question?

A. Repeat it, please.

Q. Would it have been necessary to disturb in any way these gaskets or seals on the Foster Wheeler condensers while- you were on the TURNER?

MR.. MASTROIANNI: Same objection.

THE WITNESS: Yes.

BY MR. REICH:

Q. And in what way? Describe that to us.

Page 279

A. If the piping connecting the condenser developed a leak it would to have, and it was at one time, would require a new seal. And in the salt water version issue the manhole that we went in had to have a seal that was replaced.

Q. Well, tell us a little bit about the seal to the piping that had to be repaired. What had to be done?

A. Removal, scraping, wire brushing as you heard several times.

Q. What happened when the seal was wire brushed and scraped —

MR. MASTROIANNI: Objection, lacks foundation.

BY MR. REICH:

Q. — from the Foster Wheeler condenser?

A. The usual dust, dust cloud.

Q. How far away were you from it?

MR. MASTROIANNI: Objection.

THE WITNESS: Since this was not a normal repair I was right on top of it.

BY MR. REICH:

Q. Actually at one point –

Page 280

A. If you were working on the wrench, I was right behind you over your shoulder.

Q. Okay. And with regard to the manhole, is it necessary to replace the seal when that manhole is opened and the seal cracked?

MR. MASTROIANNI: Objection.

THE WITNESS: Yes.

BY MR. REICH:

Q. Okay. And what goes into replacing that seal? Is that different kind of seal than the gasket on a flange?

A. Probably because its low temperature.

Q. What does it look like, the seal?'

A. Well if the manhole is about like this with a bunch of lugs coming out, it's a replica of the opening.

Q. And were you involved in the removal or replacement of this seal in any way —

MR. MASTROIANNI: Objection, form.

BY MR. REICH:

Q. — the manhole seal?

A. No.

Q. Were you there when it was being done,

Page 281

either replaced or removed?

A. Removed.

MR. MASTROIANNI: Asked and answered.

THE WITNESS: I can't recollect where I was when the problem started. This was not a normal problem.

BY MR. REICH:

Q. Was there normal maintenance that was required on the Foster Wheeler condensers?

A. I don't recollect any.

Q. Okay. Do you remember seeing any warning labels with regard to the dangers of asbestos either in the manuals or on the Foster Wheeler condensers?

MR. MASTROIANNI: Objection, form.

THE WITNESS: I don't recollect. I don't — I think I can say I didn't see any warnings on the condenser or the literature.

BY MR. REICH:

Q. Was there any insulation on the outside of the condensers from Foster Wheeler?

* * *

THE BABCOCK & WILCOX COMPANY BARBERTON OHIO BARBERTON OHIO

ORDER NO. #57962 DATE: September 28, 1943
ACC-4875-95
ME-3846-86

TO: FOSTER WHEELER CORPORATION

165 BROADWAY N.Y.C.

SHIP TO: INSTRUCTIONS LATER.

RENDER INVOICE IN TRIPLICATE.

VIA: FOR SHIPPING REQUIREMENTS SEE LAST PAGE.

DELIVERY:

PRICE: per ship, including tools and spares, f.o.b. cars Dansville, N.Y.; all less 9% for resale - Dup. of Contract MB-2761 Class. Progress payments to apply. (See note on last page.)

Acknowledge receipt of this order promptly and state definitely when shipment will be made.

---

84 - Foster Wheeler Navy Type Economizers (42 right hand and 42 left hand), each unit being 10 elements high and 13 elements wide and with two elements omitted for soot blowers and one element omitted for clearance; total 62 elements per unit. Length of elements 7'-0" between support plates. Unit to be built up ready for installation including pressure parts, Crane Co. drain and vent valves with necessary flanges and nipples,

> supporting tube sheets, front and rear vestibules, complete with doors. To be duplicate of economizers supplied for DD-445, Class Destroyers on our order number 41058, ME-2761-90.

Drains from Economizer rear casings are to be furnished.

This equipment must be suitable for boilers designed for 684° working pressure and the casing designed for the following.

1. Test pressure for tightness inside economizer door, 10" water.
2. Test Pressure for tightness outside economizer door, 26" water.
3. Test pressure for strength, 55" water.

The heating surface of economizer to be 3,906 square feet.

Economisers to be in accordance with drawings as approved for DD-445 and Class.

These economisers are for (21) ships, each ship requires two right hand and two left hand economisers.

21 - sets of spare parts and tools for (21) ships. Each set to consist of:

16 - Elements
25 - Handhole plugs
992 - Handhole gaskets
4 - Expanders
4 - Tube drivers
8 - 7/8" offset socket wrenches
4 - 1/2" reversible rachet wrenches
2 - Pin spanners
8 - Tube plugs
2 - Plug extractors

2 - Handhole lifting tools
2 - Crimping tools
1 - Air driven tube cleaner

Spare parts should be packed, marked and protected from corrosion in accordance with general specifications for Machinery, section 531-1 including revisions. Please note that spares are to be packed in metal boxes. Spare parts for each ship to be packed separately and marked accordingly.

Please use the attached spare parts form in connection with this order. This is Navy Standard Form for spare parts and one copy, properly filled out, is to be placed inside each spare part box. Two certified copies of this form to be forwarded to the Navy Department as required in specification 531-1 and one copy of this form properly filled out to be sent to us at Barberton. These forms to be forwarded the day shipment is made.

All material subject to inspection at the place of manufacture by a U. S. Navy Dept. Bureau of Ships Inspector.

Please notify the Inspector of Naval materials in your district at least 24 hours before inspection service is required.

The design, material, workmanship, plans, inspection test and performance of the article or articles covered by this order shall be in accordance with the Navy Dept. specification for DD-445 and Class Vessels and all applicable portions of general specifications for Machinery, and all applicable Leaflet Material specifications including all revisions and corrections as of July 1, 1940; any information regarding aforesaid specifications to be obtained on application to the purchaser and not from the Bureau of Bureau's concerned.

By your acceptance of this order you guarantee that the equipment or material to be furnished will operate or function satisfactorily and readily under all service conditions and in accordance with the specification under which the material is purchased. Any failure of this equipment or material to give the specified performance, or any defects in material or workmanship that may develop during the construction, tests or trial of the vessel or until the vessel for which equipment or material is intended is finally accepted by the Navy, shall be made good by you at your expense.

The special specifications applicable to this job insofar as they cover economizers are as follows:

"In order to provide more economical performance of the boilers, each boiler shall be provided with an economizer. Economizer shall be design, capacity, pressure drum, etc., as approved in detail by the Bureau. Each economizer shall serve only the boiler in which installed. The material and design of economizer shall be accepted as submitted in detail by the contractor and approved by the Bureau."

There are no understandings between the parties hereto as to the subject matter of this contract, other than as herein set forth. All previous communications between the parties hereto, either verbal or written, are hereby abbrogated and withdrawn, and the acceptance of this contract with the specifications and drawings referred to herein constitute the whole agreement between the parties hereto. The contract cannot be assigned except by a duly approved supplementary agreement signed by both parties, nor may the general conditions be codified.

The following cancels and supersedes the Guarantee Clause "G" which appears on the back pages of this order.

"The Seller shall defend at its own expense any suit or action brought against the Buyer based on a claim that the equipment, or any part thereof, furnished hereunder constitutes an infringement of any patent of the United States, if notified promptly in writing and given authority, information and assistance for the defense of same, and the Seller shall pay all damages and costs awarded therein against the Buyer. In case the equipment of any part thereof is in such suit held to constitute infringement and its use is enjoined, the Seller shall, at its own expense, either procure for the Buyer the right to continue using said equipment; or replace same with non-infringing equipment; or modify it so it becomes non-infringing; or remove said equipment and refund the purchase price and the transportation and installation costs thereof."

Economizers must be delivered free from dirt, chips, or any other foreign substance. Economizers must be properly protected internally and externally with a suitable rust preventive compound.

The material or articles called for by this order are to be used exclusively for fabrication of boilers, and are covered by priority rating listed below. Please wire us immediately if you receive a priority rating or request or instructions of any nature from any source whatsoever, that in any way interferes with or defers your producing and shipping the articles or materials called for as scheduled herein.

The vendor by acceptance of this order, accepts the provisions of the "NATIONAL DEFENSE CONTRACT CLAUSE", as outlined in the attached memo.

Required for (86) Marine boilers for (21) Destroyer Class DD-445 Vessels applying on Federal S.B. & D.D. Co. order (Gibbs & Cox) DD-809/O&C-209. and Navy Contract No. NObs-1107.

Ship Nos.	Shipyard
DD-528 to DD-549	Bath Iron Works, Bath, Maine

RICHARD C. JOHNSON — BY MR. STUEMKE

* * *

Page 11

Q. Okay. So what year does that take us to, sir?

A. Frankly, I have a hang-up as to whether it was '95 or '96. It was either 1995 or 1996 — wow, 1955 or 1956. I believe it was '55.

Q. Could you briefly describe generally the job titles and responsibilities that you held at Foster Wheeler over the 40 years of your career there?

A. I began as a metallurgical technician. Foster Wheeler had a branch of the Research Department in the Dansville plant, which is the area where I resided, and as such they had a metallurgist who was employed full-time at Foster Wheeler. He hired me as an assistant as in about a year, as time went by, we noticed there were many ceramic activities taking place, so I gradually assimilated some of the ceramic — some of the research and development and applications related to non-metallic materials.

Q. Let me interrupt you for just a second, sir. You said you graduated from New York State College of Ceramics; is that right?

A. Yes, sir.

* * *

Page 66

Q. I am handing you what has been marked Exhibit 8.

MR. BRYDON: Do we have a copy not marked up?

MR. STUEMKE: No, actually, on this one I am afraid we don't. The highlights won't come through on the copying.

Q. Okay. Sir, do you recognize Exhibit 8?

A. I recognize it as an engineering standard for hi-temp blocks.

Q. Is this a document prepared by Foster Wheeler?

A. Yes.

Q. What is the purpose of this form or this document?

A. These documents called "Engineering Standards" were compilations of the materials that were available for utilization in the boilers. And the properties on them were supplied by the individual suppliers of the materials and this was to enable a bidder to know which types of materials he could use when that category of block is specified.

Q. And —

* * *

RICHARD C. JOHNSON — BY MR. STUEMKE

* * *

Page 72

A. That is correct.

Q. Sir, are you familiar with how engineering standards such as Exhibit 8 were maintained by Foster Wheeler in the regular course of its business?

A. Foster Wheeler had a bound book of standards for insulation and castable brick materials as well as many other materials. And again, these were lists of available materials for specific categories.

Q. Okay. Where were those maintained?

A. They were maintained in the Contract Design Department in the main office. They were originated there.

Q. When you say "in the main office," is that in New York City?

A. Like one time New York, one time Livingston, one time Perryville.

Q. How many copies of those bound books were there at any one point in time, was there one master copy and daughter copies of that or —

A. To my knowledge, there was a master copy and as you say, daughter copies were given to appropriate personnel within the company for

* * *

Page 114

A. Yes, sir.

Q. So whoever is working on a contract at Foster Wheeler's — whoever is working for Foster Wheeler

<u>on a contract is legally bound to use the insulation materials that are in accordance with this Insulation Standard Catalogue, correct?</u>

A. <u>I don't know legally bound but if he is going to supply his material, it is logical to assume that it should be on this standards list (indicating).</u>

Q. <u>Well, it says here "legally binds the vendor or contractor to adhere to this information," correct?</u>

A. <u>Yes.</u>

Q. <u>For instance, if a subcontractor decided that he wanted to use feathers to insulate the outside of a boiler, he couldn't do that within the terms of the contract, correct?</u>

A. <u>If he wanted to change the material, you mean?</u>

Q. <u>If he wanted to put feathers on?</u>

A. <u>That is correct.</u>

Q. <u>But feathers aren't in the Insulation Standard Catalogue?</u>

* * *

Page 165

Q. It is reasonable to believe that Foster Wheeler knew asbestos insulation was being used on its boilers in the 1930s?

A. I don't know.

Q. Does it strike you as reasonable?

MR. BRYDON: The question is argumentative. For the record, even the deposition notice here begins in the 1940s. That is all he is being produced on is knowledge in the 1940s. You are getting argumentative and I think borderline harassing on this.

MR. STUEMKE: That is a bit strong. I am asking him if it is reasonable to believe that. He can testify if it's reasonable or not. You are right, the notice says "1940," so I will ask him specifically about 1940 which he is being produced to testify to.

Q. Sir, in 1940 did Foster Wheeler know that asbestos products were being used on its equipment?

A. Yes, its' obvious they had to know in some cases.

Q. And in what cases would those be?

A. Where asbestos is right on the standards, asbestos rope, asbestos cloth, asbestos cement.

Page 166

Q. And those are the standards drafted by Foster Wheeler, correct?

A. They were approved — they were materials that were specified for use in specific required applications, yes.

Q. Going back to 1940?

A. I wasn't there in 1940 but from what I had learned in 1940, they would have been using these products, I assume that.

Q. Going back to the fact that — and I appreciate sometimes in this deposition you have said what you, Dick Johnson, know personally from your experience but I am asking you Foster Wheeler, in 1940, were you aware that asbestos products were being used in association with your equipment?

MR. BRYDON: That question is argumentative as phrased and it has been asked and answered.

But go ahead.

A. Yes.

MR. STUEMKE: Thank you. At this time, why don't we break for the day.

(There was a discussion off the record.)

* * *

Page 226

Q. That wouldn't burn?

A. It would burn. That was its function.

Q. The function of the spacers was to be consumed?

A. Yes, it was there to allow for initial expansion of the brick. I wouldn't expect any asbestos to live in an environment where fire brick has been specified.

Q. Are you familiar with a product called metal paste brick?

A. I have heard of it. I have a rough appreciation for what it is.

Q. Is that a product that was ever used by Foster Wheeler?

A. Not to my knowledge.

Q. <u>Sir, you mentioned that asbestos-containing gaskets were used in association with Foster Wheeler equipment; is that correct?</u>

A. <u>Yes.</u>

Q. <u>And that would have been — well, where would those gaskets have been used on say a packaged generator manufactured in Dansville?</u>

A. <u>You will have to define the type of</u>

Page 227

gaskets in that what often is referred to as a gasket really is an insulating tape on a doorway. Do you want to include that in the gasket category or just the gaskets that are used to contain pressure within two metal flanges?

Q. For right now, why don't we go ahead and include the tape as well.

A. Okay. Gaskets were used where there would have been a high-pressure connection or a connection for a high-pressure steam or water line. These connections were flanged and when they — when the connection was effected, a gasket was put in to form a compressable resistance to any leakage at that metal flange point. As far as the tapes were concerned, every unit had to have an access door in order to enter and if an access door which had a metal flange was closed and was not properly insulated, the gases would leak in or out of the unit. So a woven metal — pardon me, a woven asbestos tape up to a quarter of an inch thick was simply adhered around the outside of the opening and if there was an opening on a larger unit such as a condenser. I do now recall a condenser being made at Dansville.

Page 228

Q. Okay.

A. They would have larger areas which the tape would be adhered to for closure when they were installed probably in the field.

Q. Okay. So those asbestos gaskets and tape would have been incorporated within the Foster Wheeler product when it left the factory?

A. Yes, there were encapsulated gaskets and tapes on different products that left the factory.

Q. Okay. And with respect to field-erected equipment, there was — there were asbestos-containing gaskets utilized in connection with that type of equipment as well, correct?

A. It's logical to assume that there would have been, yes.

Q. You also testified yesterday about the usage of asbestos cloth in association with Foster Wheeler equipment; do you recall that?

A. Yes, sir.

Q. And how would asbestos cloth have been used in association with Foster Wheeler equipment?

A. Asbestos cloth was used in two areas. One, it sometimes was draped over a steel frame to protect any passers-by from weld splatter or the

Page 229

arc of the weld processes. It also was used in stress-relieving operations where an electrical — electrically-induced coil was wrapped around a pipe configuration between 4 and 40 inches in order to heat the pipe.

Because it had to be insulated from the pipe, sometimes the cloth would be placed between the wrapping of the electric element and the pipe. Sometimes a blanket was used. Asbestos cloth, sometimes in rare circumstances if a gasket wasn't available that should have been made out of a sealed closure, such as the condenser I mentioned, somebody might cut a gasket or whatever you want to call it, cut a closure device, but let's call it a gasket, out of 1/8-inch thick cloth to the shape that it would be protecting on a flanged element

Lastly, the cloth was used someties to — when a welder was completing a weld, the tube he was welding would get very hot and therefore to protect himself, he chose to insulate himself with a piece of cloth that had been used for the induction heating. Those were the major areas where cloths were used.

Q. Okay.

* * *

JOHN B. DeVRIES

* * *

Page 81

Q. Do you know who manufactured any of the turbines aboard the USS TURNER?

A. General Electric.

THE VIDEOTAPE OPERATOR: Excuse me, counselor. There's five minutes left on the video.

MR. STOKES: Thank you.

BY MR. STOKES:

Q. Do you recall if any maintenance or repair work was performed in your vicinity around any of the steam — steam generators.

A. What do you mean by steam generators?

Q. I believe you testified that there were steam generators aboard the ship?

A. Well, that's a boiler.

Q. Okay. So a boiler and a steam generator are the same thing?

A. I don't remember where steam generator came into our conversation.

Q. Okay. I'm sorry. Maybe I misheard you. In any event, the boilers you testified they were all manufactured by Babcock and Wilcox; correct?

A. Correct.

* * *

Page 310

MR. KATTNER: I'd be glad to do so.

MR. REICH: I appreciate that.

BY MR. KATTNER:

Q. Okay. All right. Maybe we can approach it this way. One piece of equipment that you attribute to General Electric is the main propulsion turbine; is that correct:

A. Yes.

Q. Okay. And if you could turn to your Exhibit 2, do you have that in front of you?

MR. REICH: We will in a minute.

MR. KATTNER: That's the 1945 and then the hull data. Oh, he has it in front of him.

THE WITNESS: I have it in front of me.

BY MR. KATTNER:

Q. Okay. Sir, you'll agree that the first page of Exhibit 2 appears to be from the supervisor of shipbuilding, U.S. Navy, Bath, Maine dated June 9, 1945. subject references, among other things, the USS TURNER DD 834; is

Page 311

that correct?

A. Yes.

Q. And I understand you were not present at the time this activity occurred; is that correct?

A. Yes.

Q. All right. Under B it states, Certificate as to condition of machinery. And I'll read, it says, It is hereby reported that the machinery of the subject vessel including engines, boilers, appurtenance, spare parts is strong and well-built and in strict accordance with drawings, specifications, and duly authorized changes therein except for listed on the work list cards furnished the Board. Is that correct?

A. I read it the same.

Q. And my understanding is the reference to engines includes the propulsion unit or the turbine by your understanding as an officer in the Navy?

A. Yes.

Q. Now, did you review the specifications that the Navy made for the turbine on the ship

Page 312

at any point in your career?

A. Yes.

Q. For purposes of doing your job as an engineering officer?

A. As reference material for —

Q. I've got you. And there were copies of these specifications on the ship, were they or not? Some were, some weren't?

MR. REICH: But can you —

MR. KATTNER: Okay. I didn't mean to cut him —

MR. REICH: Okay. Slow down.

MR. KATTNER: I'll slow down. Yes.

MR. REICH: Thank you.

BY. MR. KATTNER:

Q. Go ahead, sir.

A. Your observation is right. Some were, some weren't.

Q. Okay. And you can't tell us specifically which specs were on the ship and which weren't, can you, at this point?

A. I cannot recollect.

Q. But that was a decision made by the

* * *

Page 330

Q. Yes.

Q. Okay.

MR. REICH: You are just talking in general about —

MR. KATTNER: I'm talking in general right now.

MR. REICH: Okay.

BY MR. KATTNER:

Q. With respect, however, to the selection of what insulation was put on the turbine on the TURNER at the time of its initial installation in 1945, I take it you have no knowledge as between the equipment manufacturer or the shipbuilding in Bath, Maine who selected that insulation, do you?

A. I have no knowledge.

Q. And with respect to the Navy specifications as to use of asbestos or other materials on turbines or other machinery you do not have personal knowledge as to what besides asbestos the Navy may have specified?

A. I have no personal knowledge of it.

Q. Okay. Now, and with respect to specifications that might say the equipment

Page 331

manufacturer would state temperature ranges and then the shipbuilder would select insulation, again, that's not something you personally even became involved in?

A. True.

Q. Okay. Now, in this first three months, forced draft blower work before Boston, you were present when ship's crew and in command of them when they ripped out the insulation; correct?

A. I was present.

Q. Did you breathe dust from their operation?

A. I breathed dust from whatever they did because we had a dust cloud. And I — I was there for two reasons. I was there to learn.

Q. I see.

A. And I was there for whatever other supervisory reason.

Q. And I think you answered yesterday — well, let me ask you this. As to the dust that came from the forced draft blower itself versus other pieces of equipment you cannot differentiate at this point, can you?

Page 332

A. I can't — I cannot differentiate between the boiler and the draft blower for example.

Q. Okay. And with respect to whether that insulation that was then removed had been original to the ship or replacement over the years before you don't know?

A. I have no way of knowing.

Q. And as to who had originally supplied the first round of insulation you don't know?

A. I have no way.

Q. And if there were any replacements you don’t know who supplied that insulation that was ripped out?

A. Yes.

Q. You just don’t know?

A. (The witness nods.)

Q. Is that correct?

A. Just don’t know.

Q. Okay. And then after these initial repairs were done in this dry dock in the first three months or so was the insulation replaced on the forced draft blowers before the ship went to Boston?

* * *

Page 353

USS TURNER, you mentioned that somewhere around the holidays near Monte Carlo there was some further work on one of the turbines that kept you on the ship while others were able to get off; correct?

A. Easy to remember.

Q. Understood. And I understand that the turbines were open to check stress bearings was your testimony?

A. I believe they were open to check a bearing.

Q. Got you. In terms of your personal presence during the operation of that — in that Monte Carlo stress bearing series of events, were you present when the insulation was ripped off or not?

A. Yes.

Q. You were present in —

A. I was present when the insulation was ripped off.

Q. And was that the same insulation that had been installed at the Boston overhaul? It was ripped off there? Or it was the blankets and something else? What was it?

Page 354

A. I can't be sure it was the same, but I don't recollect any replacement of insulation prior.

Q. I see. But you weren't — you don't know what or who supplied the insulation that the Boston shipyard had put on in terms of the mud?

A. I do not.

Q. And in terms of whether they used the same or different blankets back on at the Boston overhaul you weren't there to see that either?

A. I wasn't there. I wasn't there to see things put back together.

Q. But from being on the ship, it was mostly at sea during the intervening time, correct, before this Monte Carlo holiday turbine incident?

A. Yes.

Q. And you don't know of any other work done to disturb the insulation on the turbine before this Monte Carlo holiday incident?

A. Yes.

Q. You do or you don't?

Page 355

A. I do not.

Q. You do not know. So the next thing you know was this thing at Monte Carlo?

A. We need to open and check.

Q. And was it the ship's personnel or yard personnel who took the insulation off, ripped it off?

A. Ship's personnel.

Q. I got you. And then the cover was taken off the turbine. And what repair was made, to your understanding?

A. A problem part was removed. We were fortunate to have the services of the machine shop on a — I guess it was a cruiser moored in Villa, France. And the part was duplicated by that vessel and — and the new part reinstalled by our people.

Q. And these internal parts is it safe to say they were real metal parts?

A. These were metal.

Q. And you don't — you personally don't associate any asbestos with any of the internal parts involved in that?

A. Not with the internal parts.

Page 356

Q. In fact, the inside of the turbine is kept relatively clean —

A. Clean.

Q. — metal; correct?

A. Yes.

Q. It has to be for its function?

A. It has to be.

Q. Is that correct?

A. Yes. It has to be clean.

Q. Then the turbine was covered back up?

A. The cover was put back on and the —

Q. Insulating blankets —

A. Insulation however could be put back on was reinstalled.

Q. Were you present when it was re-insulated?

A. I was present when it was re-insulated. I was present through the whole process.

Q. Now, when you say through the whole process, I'm just asking realistically was this every single minute the people were working or in and out of the area where they were working on that?

A. Any time the turbine was being worked on

Page 357

or opened.

Q. I see. That included the rip out and the re-insulation process?

A. That included the rip out and the removal of the insulation and going further the dust from that event.

Q. And at the time of this Monte Carlo turbine repair on the USS TURNER, were you the engineering officer in charge or were you not yet there?

A. I was responsible. I don't remember whether I was the engineering officer or not.

Q. So whether you had —

A. I would have had to have been engineering officer because I wasn't able to leave because the TURNER — the turbine was open.

Q. So you were the officer that the Navy had in charge of that operation?

A. I was responsible.

Q. And the people doing the job worked under your orders?

A. Yes.

Q. And with respect to the procedures they

Page 358

did, I take it you directed them to follow the procedures in accord, as you have said many times, with the combination of what was in the manufacturers' manuals or what the Navy had trained you to do; correct?

A. Yes.

Q. And is it your understanding that the workers doing that job were required to do what you as the Naval officer told them to do?

A. Yes.

Q. And with respect to masks, respirators or dust protection, did you give any special orders during that Monte Carlo repair?

A. No.

Q. Did you see any contradiction at any — you have already told me that. I'm not going to go back there.

Now, were there any further repairs to disturb the insulation on the turbine after that Monte Carlo incident and before you left the USS TURNER that you recall?

A. Yes.

Q. And what else happened?

Page 359

A. The Navy had the TURNER go through a repair, a program called FRAM, fleet rehabilitation and maintenance. FRAM was scheduled for Brooklyn Navy Yard. The captain and I developed work lists, work orders for FRAM. We developed work orders that would check all important or portions of the ship including the turbines.

Q. Okay. And I'm sure again ship records will be available at some point and they may show more detail about this. I'm going to ask your recollection here.

I believe your testimony was the ship physically was in the Brooklyn Naval Yard during the last part of your service on the USS TURNER; is that correct?

A. I was on the ship while in the yard and separated from the Navy while the ship was still in the yard.

Q. Just trying to get the dates nailed down. You separated from the Navy what date?

A. It would have been June 1960.

Q. Okay. Before or after the Kennedy Nixon TV debate?

Page 360

But in any event. June 1960 you separated from the Navy. The ship was in the Brooklyn Navy Yard at that time?

A. Yes.

Q. For its FRAM overhaul?

A. The work was ongoing.

Q. Got you. And how long before you separated had the ship arrived in Brooklyn Navy Yard by your recollection?

A. I don't recollect. The removals were well underway.

Q. What I'm trying to get was it two weeks or a half a year>

A. Several weeks.

Q. Several weeks.

A. Maybe several months.

Q. Okay. So to estimate, your best recollection is some time in early 1960 it arrived at the Brooklyn Navy Yard for the beginning of the FRAM, but you don't remember exactly when?

A. I wouldn't say early '60, but, yes, it was spring of '60.

Q. Fair enough estimate. And then in

* * *

BY: E. MICHAEL KEATING, III, JUSTIN S. WALKER
E-MAIL ADDRESS: EMK@HKCJG.COM
IDENTIFICATION NO. 19350; 84194
HOLLSTEIN KEATING CATTELL
JOHNSON & GOLDSTEIN, P.C.
1628 JOHN F. KENNEDY BOULEVARD
SUITE 2000
PHILADELPHIA, PA 19103
(215) 320-3260

ATTORNEY FOR DEFENDANT,
GENERAL ELECTRIC COMPANY

JOSEPH BEAUSEJOUR and PATRICIA BEAUSEJOUR	:	PHILADELPHIA COUNTY COURT OF COMMON PLEAS CIVIL DIVISION
Plaintiff(s)	:	ASBESTOS CASE
v.	:	
	:	SEPTEMBER TERM, 2007
A.W. CHESTERTON, INC., et al.	:	
Defendant(s)	:	No. 2778

1. <u>DEFENDANT GENERAL ELECTRIC COMPANY'S ANSWERS, RESPONSES AND OBJECTIONS TO PLAINTIFF'S INTERROGATORIES AND REQUESTS FOR PRODUCTION</u>

Defendant, General Electric Company ("GE"), by and through its undersigned counsel, and pursuant to Pa.R.C.P. 4005 and 4009.1, hereby files its answers, responses and objections to plaintiff's interrogatories and requests for production as follows:

2. PRELIMINARY STATEMENT AND GENERAL OBJECTIONS

1. GE generally objects to Plaintiffs' Interrogatories and Request for Production on the grounds that they are overly broad, unreasonably burdensome, oppressive, expansive, not reasonably tailored to this case and the issues therein, and not reasonably calculated to lead to the discovery of admissible evidence. Plaintiffs' discovery should be addressed to the products to which plaintiff was allegedly exposed at a particular place and time. Without such specificity, it is impossible for GE to respond and the discovery is simply a fishing expedition.

* * *

purports to go beyond the product that GE understands to be primarily at issue with respect to GE in the above-captioned matter. Subject to and without waiving the foregoing and any of its objections, GE incorporates its Answers to Interrogatory No. 6 by reference as if fully set forth herein.

28. When did you first become aware that airborne dust containing asbestos fibers or fibrils would be created in use or removal of your asbestos products by an insulation worker or other workers could cause asbestosis, pleural thickening or pleural plaque, mesothelioma, or lung cancer? Please identify the date of this knowledge by product whether raw asbestos or a finished product and the date of knowledge that each of the diseases set out could develop from exposure to asbestos.

ANSWER: GE objects to this Interrogatory to the extent that it is overly broad, unduly burdensome, and not reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving any of its objections, GE notes that the amount of materials published in both the technical and popular press that discuss possible correlation between exposure to asbestos at sufficient levels, especially friable, amphibole asbestos, and human health consequences is voluminous and GE is unable to state on what specific date it first became aware of a possible correlation between exposure to asbestos at sufficient levels and human health. GE further states that because it is a large, decentralized company with facilities in numerous states and foreign countries, and because there is no central repository for information of the type sought by way of this interrogatory, GE may no longer have, or never have had, many of the documents required to fully answer this interrogatory. GE reserves the right to supplement its response.

However, at all times GE's respective businesses and the personnel of the respective businesses kept apprised of the government standards, regulations, and laws, as well as prevailing safety standards, industry standards, and standards of medical art as they related to the operation of GE's respective businesses. GE notes that the term "asbestosis" was first coined in 1928 and that in the 1930s GE medical personnel and consultants would have been aware of the ability of exposure to certain dusts, such as silica, coal, cotton, and asbestos at sufficient levels to cause pneumoconiosis. By the early 1950s, Dr. Irving R. Sax of its Schenectady office was aware of the risk of asbestosis from high levels of exposure to asbestos dust and Dr. Sax made this information publicly available in his book, Handbook of Dangerous Materials (Reinhold

Publishing 1951). Likewise, Dr. John Grimaldi, a consultant for health and safety for GE from 1956 to 1967, published in 1956 a treatise on industrial hazards (entitled "Safety Management") which included a caution on the hazards of asbestos. A second edition of this treatise was published in 1963). Further, GE would have been aware of the threshold limit values ("TLVs") first promulgated by the American Conference of Governmental Industrial Hygienists ("ACGIH") and adopted by ACGIH at or about 1946 and permissible exposure limits ("PELs") when first enacted by OSHA in the early 1970s for a variety of substances. GE would have been aware of state industrial codes adopting TLVs and the Walsh-Healy requirements that all federal government contractors meet the ACGIH standards. GE also would have been aware of the "Minimum Standards" issued by the U.S. Navy in 1943. Likewise, customers for the GE products discussed in these discovery, responses are, and were typically sophisticated entities such as the government, utilities, ship owners, shipbuilders, and industrial manufacturers who also would have been aware of TLVs, maximum allowable concentrations ("MACs"), PELs, and other standards promulgated by various governmental organizations and professional associations. A copy of Dr. Sax's book can be made available upon request at a mutually convenient time and place. Documents concerning GE's knowledge can be made available for review at a mutually agreeable time and place.

* * *

(b) Tests or studies by any independent organization;

(c) Tests conducted on humans or animals on your behalf or on behalf of any co-defendant in this action. If your answer to any of the subsections (a) through (d) is in the affirmative, for each test or study state:

(1) The date it began;

(2) The date ended;

(3) The procedure of the test or study;

(4) The number of man hours spent on it;

(5) The place where it was conducted.

ANSWER: GE objects to this Interrogatory on the grounds that it is overly broad, not time, site or product specific, unduly burdensome, and not reasonably calculated to lead to the discovery of admissible evidence. Furthermore, as set forth in its Preliminary Statement and General Objections, *supra*, incorporated herein, GE objects to the extent that this Interrogatory purports to go beyond the product that GE understands to be primarily at issue with respect to GE in the above-captioned matter. Subject to and without waiving the foregoing and any of its objections, GE incorporates its Answers to Interrogatory No. 6 by reference as if fully set forth herein.

33. Have you, at any time, been a member of any "trade association or organization" composed of other miners, manufacturers, suppliers, distributors, producers, processors, compounders, converters, sellers, merchandisers, and/or anyone otherwise placing in the stream of commerce asbestos products? If so, state:

(a) Identify each such association or organization;

(b) The dates during which you were a member;

(c) The names of any publication published by or written by such association or organization;

(d) The dates and addresses of all other members;

(e) What meetings you attended and identify who attended;

(f) Who spoke at such meetings;

(g) Were transcripts or summaries or minutes or notes made of such meetings? If so, identify the above, tell specifically what was made and give the name, title and address of the person or persons who have custody of the transcripts and/or summaries and or minutes and/or notes mentioned above and state when and where counsel for the plaintiff may examine and copy these documents.

ANSWER: GE objects to this Interrogatory on the grounds that it is overly broad, unduly burdensome, not reasonably tailored to the issues of the case, and not reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing or any of its objections, GE answers as follows:

GE is not now, nor has it ever been, a miner, miller, importer, distributor, or marketer of raw asbestos fiber, nor been in the (regular) business of selling raw asbestos fiber; nor has it manufactured asbestos-containing thermal insulation products. GE has never been a member of the asbestos industry as that term is commonly used, nor has it ever been a member of the trade organizations of the asbestos industry. Answering further, upon information and belief, some of GE's employees were members of the National Safety Council ("NSC") in the early 1900s. GE has not been able to locate historical materials in its possession received from the NSC or which relate to the NSC other than materials which post-date 1991. These post-1991 documents were located in a file maintained by GE's Corporate Environmental Programs in Fairfield, Connecticut, and include a number of brochures on safety related matters — *e.g.*, defensive driving — and records showing that GE paid its NSC membership dues during various times in the 1990s. GE has obtained copies of the NSC's periodicals National Safety News and NSC Transactions. Upon request, GE will produce copies of these documents to Plaintiffs' counsel at a mutually convenient time and place. Further, GE states that it has also been brought to GE's attention through historical documents produced by other parties in asbestos-related litigation that some of its employees were members of the NSC at some points in their individual careers. Upon request, GE will produce copies of these documents to Plaintiffs' counsel at a mutually convenient time and place. A review of these historical NSC materials reflects that over the last nine decades, dozens of GE employees have contributed time and resources to various NSC committees and served as Board members.

GE is continuing to search for documents in its own files confirming membership in the NSC with its own records historically, but, other than the aforementioned materials, none have yet been located. GE's investigation continues and it reserves to supplement this response if additional relevant material becomes available.

Upon information and belief, in 1947, GE became a member of the Industrial Hygiene Foundation ("IHF"), an association of industrial hygiene professionals from government, academia, and industry which shared technical information relating to current industrial hygiene topics about numerous industrial materials among its members. GE has not been able to locate historical materials in its possession received from the IHF. Investigation continues. It has also been brought to GE's attention through documents produced by other parties in asbestos-related litigation that some of its employees were members of the American Ceramics Society at some points in their individual careers. However, GE has not been able to locate these documents in its own files, and therefore cannot attest to their authenticity. Investigation continues. Nonetheless, upon request, GE will produce copies of these documents to plaintiffs' counsel at a mutually convenient time and place. GE further states that it has not been able to locate historical materials in its possession received from the American Ceramics Society. Investigation continues. GE further states upon information and belief that certain GE's businesses were at various points in time members of the National Electrical Manufacturers Association ("NEMA"), and that GE President Gerard Swope was the first President of NEMA. Additionally, some of GE' s employees may have been members of the American Conference of Governmental Industrial Hygienists ("ACGIH") at some points in their individual careers. GE has not been able to locate historical materials in its possession received from the ACGIH during the relevant time period. GE further states, however, that it is continuing to search for documents in its own files confirming its historical membership in the ACGIH.

Upon information and belief, some of GE's employees are currently members of the American Industrial

Hygiene Association. However, GE has not been able to determine whether any of its employees previously may have been members of the American Industrial Hygiene Association at some points in their individual careers or whether GE received any historical materials from the American Industrial Hygiene Association. Investigation continues and GE reserves the right to supplement its response accordingly.

By way of further response, and to the extent that this Interrogatory seeks additional information GE states that because GE is a large, decentralized company with facilities in numerous states and foreign countries, and because there is no central repository for information of the type sought by way of this interrogatory, GE may no longer have, or may never have had, the documents required to more fully answer this interrogatory. GE is a large, decentralized company comprised of numerous separate businesses with over 300,000 employees. GE operates in more than 100 countries around the world, and since 1979, GE has bought and/or sold thousands of businesses. See http://www.ge.com/investors/financial_reporting/annual_reports.html.

* * *

calculated to lead to the discovery of admissible evidence. Subject to and without waiving any of its general and specific objections, GE states that it is a large, decentralized company that maintains no such library or collection of literature related to the subjects of asbestos, industrial hygiene, medicine, safety and/or occupational disease in any centralized location. However, GE states that at all times its respective businesses and the personnel of the respective businesses kept apprised of the government standards, regulations, and laws, as well as prevailing safety standards, industry standards, and standards of medical art as they related to the operation of GE's respective businesses. Further, GE's employees of its myriad divisions, plants, offices, and other facilities over the years may have maintained individual libraries and collections particularized to the businesses in which they were engaged. GE, however, has never been a member of the asbestos industry, as that term is commonly understood, and instead has historically been a manufacturer of electrical equipment and appliances for both industrial and consumer applications. It is impossible, given the size of the company, its decentralized structure, and the diversity of its businesses and·facilities, to determine the type, size, and contents of any libraries or collections of literature and other materials that may have been maintained at individual sites over the years, or the employees who may have been involved in maintaining them. By way of further response, GE currently maintains a general medical library at its corporate offices located at 3135 Easton Turnpike, Fairfield, Connecticut.

HOLLSTEIN KEATING CATTELL
JOHNSON & GOLDSTEIN, P.C.

By: /s/ Justin S. Walker
E. Michael Keating, III
Justin S. Walker
Counsel for General Electric Company

Date: 1/16/2007