

FILE NAME: Johns-Manville (JMA)

DATE: 1944-1945

DOC#: JMA182

DOCUMENT DESCRIPTION: Health Survey of Pipe Covering Operations in Construction Naval Vessels with Letters & Memos

OFFICE OF
SUPERVISOR OF SHIPBUILDING
UNITED STATES NAVY

BETHLEHEM STEEL COMPANY (SHIPBUILDING DIVISION)
QUINCY YARD, QUINCY 68, MASSACHUSETTS

IN REPLY REFER TO NO.

P2-4(Q7781-SO)

6 MAR 1945

From: SupShip, Quincy
To: BuShips (768)

Subj: Industrial Health and Safety - Survey concerning
Asbestosis

Ref: (a) BuShips ltr P2-4(768-G) of 24 Feb 1945 to
SupShip Quincy

1. In reply to ref (a), Bethlehem Steel Company is willing to permit a survey concerning asbestosis.
2. It is requested that the Supervisor be informed as to the proposed date of subject survey.

Marion A. Roberts
Marion A. Roberts
By direction

3080673 ✓

UNITED STATES MARITIME COMMISSION
WASHINGTON

March 1, 1945

Navy Department,
Bureau of Ships,
Washington 25, D. C.

Attention: Admiral Mills.

Subject: Industrial Health and Safety - Survey
Concerning Asbestosis.

Gentlemen:

I beg to acknowledge copies of your letters of February 24, to Supervisors of Shipbuilding of New York SB Corporation, Bureau of Medicine and Surgery, and Supervisor of Shipbuilding, Bethlehem Steel Company, Quincy.

We appreciate very much your prompt attention to this matter and will keep you advised as the surveys in question are carried out.

Sincerely yours,

Philip Drinker

Philip Drinker.

PD:epb



3050117

ALG:lh
2-16-45
2-19-45

Section 768

P2-4 (768-G)

To: Supervisor of Shipbuilding, USN
New York SS Corp.
Camden, N. J.

24 FEB 1945

Subj: Industrial Health and Safety - Survey Concerning
Asbestosis.

Ref: (a) Ltr. Philip Brinker to BUMAS of 31 January 1945.
(b) BuShips ltr. P2-4(768), ES28/A2-11 of 19 November
1943 to all SupShips, et al.

Encl: (H.V.)
(A) Copy of reference (a).

1. In reference (a) the Chief Health Consultant of the Maritime Commission states that it has been revealed by a health inspection at Bath Iron Works that those persons working with asbestos pipe covering are exposed to a fairly serious dust risk. He recommends that a survey be made at two Navy Yards and two contract shipyards, including the New York Shipbuilding Corporation, Camden, New Jersey.
2. In furtherance of the safety and health program outlined in reference (b) and enclosures thereto, it is requested that arrangements be made with the management of the shipyard to permit the survey requested in reference (a).
3. The expense of the survey should be very nominal, consisting only of the salaries of the men examined during the time they are being examined. Facilities of the yard should be placed at the disposal of the investigating personnel. In case the contractor is not willing to absorb the expense as a labor charge, it is requested that the Bureau be notified and other arrangements will be made.

CC: BSCP (868) w/c encl. (A)
BUMAS
Dr. Brinker
Comfour (ESaFO) w/c encl. (A)

R. E. Jones
By direction of
Chief of Bureau

Section 708

P2-4 (708-0)

ALG:lh
2-16-45
2-19-46

To: Supervisor of Shipbuilding, USN
Bethlehem Steel Company
Shipbuilding Division
Quincy 69, Mass.

24 FEB 1945

Subj: Industrial Health and Safety - Survey Concerning
Asbestosis.

Ref: (a) Ltr, Philip Drinker to BuM&S of 31 January 1945.
(b) BuShips ltr. P2-4(708), EX28/A2-11 of 19 November
1943 to Comits, all Naval Districts.

Encl: (H.W.)
(A) Copy of reference (a).

1. In reference (a) the Chief Health Consultant of the Maritime Commission states that it has been revealed by a health inspection at Bath Iron Works that those persons working with asbestos pipe covering are exposed to a fairly serious dust risk. He recommends that a survey be made at two Navy Yards and two contract shipyards, including the Bethlehem Yard at Quincy, Mass.

2. In furtherance of the safety and health program outlined in reference (b) and enclosures thereto, it is requested that arrangements be made with the management of the shipyard to permit the survey requested in reference (a).

3. The expense of the survey should be very nominal, consisting only of the salaries of the men examined during the time they are being examined. Facilities of the yard should be placed at the disposal of the investigating personnel. In case the contractor is not willing to absorb the expense as a labor charge, it is requested that the Bureau be notified and other arrangements will be made.

CC:
SECY (565) w/c encl. (A)
BuM&S
Dr. Drinker
ComCom (DSaFO) w/c encl. (A)

R. E. Jones
By direction of
Chief of Bureau

Section 768

P2-4(768-G)

**To: Industrial Manager, U.S. Navy
Eighth Naval District
Federal Building
New Orleans, La.**

57 MAY 1944

**Subj: Alabama D. D. & Shipbldg. Co., Mobile, Alabama; Industrial
Safety & Health in Repair Yards.**

**Refs: (a) Industrial Health Survey of Alabama Dry Dock, dated
January, 1944.
(b) INDMAN's ltr. L4-3/P2-4/INB (FS:cc) Serial No.
IM 22615, of April 5, 1944.
(c) BUSHIPS ltr. P2-4(768) EN28/A2-11 of Nov. 19, 1943.
(d) Minimum requirements for Safety and Industrial
Health in Contract Shipyards.**

1. In reference (a), recommendation was made that a ventilation organization be formed in the Repair Division of the subject yard, and that sufficient blower equipment should be acquired. This recommendation was based on the finding that due to inadequate ventilation, excessive concentrations of toxic fumes existed in certain compartments examined.

2. In reference (b), the Industrial Manager requests advice as to his responsibility concerning safety and health at repair facilities holding contracts for repair of Naval vessels, and further if action is to be taken in connection with Navy-Maritime Commission safety and health surveys of such facilities.

3. It is realized that references (c) and (d) purport to refer only to shipyards engaged in new construction. However, if a condition which is detrimental to the health or safety of employees exists in a repair yard, and is brought to the attention of the cognizant Navy technical inspector, by whatever means, such inspector should take the proper steps to remedy the situation. If the deficiency exists in a privately owned facility, the contractor should be requested to effect the necessary change. If an improvement to a Navy-owned facility is indicated, recommendation should be made to the Bureau. Safety and health measures which do not involve the acquisition

Section 768

P2-4(768-G)

ALB-MLC

5-4-44

PL:FK

of facilities are considered the obligation of the contractor, and request should be made for their being put into effect.

4. In the instant case it appears that recommendations have been made regarding a Navy-owned, privately operated repair facility. If an addition to the facility is necessary to maintain proper standards of safety or health, the Bureau will entertain a request for funds. However, such an addition must consist of a capital expenditure. "Facilities" do not include small, pilferable or expendable items of the nature of loose and hand and portable power tools. Such items must be treated as an overhead cost, to be financed by the contractor and depreciated by acceptable accounting standards.

5. The salaries of personnel, or other expense of a safety and health organization, are considered the obligation of the contractor, usually accounted for as an overhead item.

J. J. Broshek
By Direction of
Chief of Bureau

CC:

SOSED: Atten. Capt. Simmers
Maritime Commission, Wash, D. C.

Lt. A. L. Green

768

Rm. T3-1701

Ext. 61049

In reply address not the signer of this letter, but Industrial Manager, U. S. Navy, Eighth Naval District, Federal Building, New Orleans, La.

INDUSTRIAL MANAGER, U. S. NAVY
EIGHTH NAVAL DISTRICT
FEDERAL BUILDING
NEW ORLEANS, LA.

Refer to No.

L4-3/P2-4/TMS

(FS:ec)

Serial No. IM _____

22615

5 APR 1944

To: Chief of the Bureau of Ships.

Subj: Joint Navy-Maritime Commission Project with respect to Safety and Industrial Health in private shipyards having Navy contracts.

Ref: (a) Safety and Industrial Health Pamphlet - Minimum Requirements.
(b) SecNav ltr. SCSED-1D-LSB 901 4/22 dtd. 5 May 1943.
(c) SecNav ltr. P2-4 (768)EN28/A2-11 dtd. 19 November 1943.
(d) Industrial Health Survey of Alabama Dry Dock and Shipbuilding Company.

1. Ref. (a) is a pamphlet containing information and instructions relating to the joint Navy-Maritime Commission Safety and Health program in private shipyards. The forward page of this pamphlet advises Naval Supervisors of Shipbuilding that they should assist and cooperate with "certain Maritime Commission Officials identified with this project".

2. Ref. (b) directs the Chief of all Bureaus to cooperate with the Maritime Commission in Safety and Industrial Health Programs for private shipyards holding Navy and/or Maritime contracts.

3. Ref. (c) is a further elaboration of Ref. (b) and further states that "the Maritime Commission is acting as the Navy's agent" and that "authority for action on defects or deficiency the correction of which will involve increased cost to the Government shall be obtained from the Chief of the Bureau of Ships".

4. Ref. (d) is an Industrial Health Survey of the Alabama Dry Dock & Shipbuilding Company conducted in accordance with References (a), (b) and (c). Although no mention has been made in any of the above references of Repair Divisions in shipyards, Ref. (d) included a report on Industrial Health in connection with the repair division of Alabama Dry Dock & Shipbuilding Company, which corporation holds an NCbs type contract for the repair and alteration of naval vessels.

5. The Bureau is therefore requested to advise this office of its responsibility

4119444

L4-3/P2-4/DM8

(FS:ec)

Serial No. DM

22815

5 APR 1944

Subj: Joint Navy-Maritime Commission Project with respect to
Safety and Industrial Health in private shipyards having
Navy contracts.

at repair facilities holding NObs type contracts for the repair and alteration of Naval vessels within this district insofar as the contents of Refs. (a), (b) and (c) are concerned, and further, if action is to be taken by this office in connection with surveys made of industrial health conditions therein an example of which is the recommendations contained along these lines in pages 3 and 4 of "Recommendations" contained in Ref. (d).


H. L. DODSON

Industrial Manager, USN, 8ND.

CC: U.S. Maritime Commission
(Lt.(jg) J. F. Morgan).

P2-4	768
	EW
	52

4110444

Section 768

P2-4(768-G)

ALG-MLC
4-19-44

To: Secretary of the Navy (SED)

10 APR 1944

Subj: Industrial Safety & Health, Survey of Respiratory Diseases in Shipyards.

Refs: (a) BUSHIPS ltr. P2-4(768-G) to BUMED of 24 Mar. 1944.
(b) BUMED'S ltr. BUMED-Y-TPC P2-4/LL(062-39) of 10 Apr. 1944 to BUSHIPS.

Encl: H.W.

(A) Copy of reference (b).

1. By reference (b), the Bureau of Medicine & Surgery, in response to reference (a), stated that it will conduct the subject survey in Navy Yards for comparison with the like survey to be conducted by the Maritime Commission in Maritime contract yards.

2. In order that the Maritime Commission may have opportunity to make a research concerning the hazards arising out of destroyer construction, it has been decided to make arrangements for a survey by the Maritime Commission staff in two Navy contract yards, Seattle-Tacoma at Seattle, Washington, and Consolidated Steel at Orange, Texas.

A. L. Green
By direction of
of Bureau

NAVY DEPARTMENT

WASHINGTON

NN/P2-4(1)(390613)
SCSED-2-EGM

13 June 1939.

SAFETY ENGINEERING ORDER NO. 2-39.

From: The Assistant Secretary of the Navy,
(Shore Establishments Division).
To: Shore Stations, Bureaus and Offices, Navy Department.
Subject: Safety Engineering Organization.

1. The Navy Safety Organization comprises the Departmental Safety organization and Field Safety organizations:

2. Departmental organization:

- (a) The Director of Shore Establishments administers Safety Engineering matters under the Assistant Secretary of the Navy.
- (b) The Navy Department Safety Engineer is attached to a section of the Shore Establishments Division and performs his duties under the supervision of the Director, Shore Establishments Division, or an officer of that Division, designated by the Director.
- (c) The duties of the Navy Department Safety Engineer include:
 - (1) Preparation of specifications for designated safety material in consultation with other government agencies.
 - (2) Consultation with representatives of other Government Departments and agencies on Safety Engineering matters.
 - (3) Development of safety material as authorized and within limits of appropriations.
 - (4) Visiting, as ordered by the Director of Shore Establishments, units of the Naval Shore Establishment, for the purpose of inspection of safety methods, materials, and industrial conditions with reference to safety, fire, and health of personnel. Reports of such inspections will be submitted on the spot to the Commandant or Commanding Officer in memorandum form and defects or deficiencies will only be made the subject of official comment if not corrected.
 - (5) Liaison with other government and civilian Safety organizations.

- (6) Conduct of safety campaigns and competitions under the supervision of the Director of Shore Establishments.
- (7) Conduct, in collaboration with the Bureau of Medicine and Surgery of research into industrial health hazards and necessary corrective measures.
- (8) Planning and conduct of safety educational activities, including supply of posters, exhibits, etc., within limits of available appropriations.
- (9) Collection, analysis, and evaluation of accident statistics.
- (10) Conduct of research into mutual relation of equipment design and industrial hazard.
- (d) The Navy Department Safety Engineer will not concern himself with matters of procurement in connection with Safety material; procurement is the province of the Bureaus and Offices controlling appropriations concerned. The Safety Engineer's interest in procurement is confined to specifications and the inspection of safety material for adherence to specifications.

3. Field Organization:

No safety organization is prescribed for units of the Shore Establishment; safety is a responsibility of Commandants and Commanding Officers to be fulfilled as the Commandant or Commanding Officer may prescribe. However, analysis and study over several years have indicated that certain factors exert a strong influence on reducing frequency and severity of accidents; these factors are presented as of possible use to Commandants and Commanding Officers in building up and improving their safety organizations.

- (a) Use commissioned officers as Safety Engineers with suitable civilian assistance to insure permanence of records, continuity of effort, etc.
- (b) Have safety engineers function as direct representative of Commandant or Commanding Officer, or of Manager in industrial yards.
- (c) Assign responsibilities for safety wherever possible to officers in the organization;
- (d) Assign responsibilities for safety to shop superintendents, foremen and leaders;
- (e) Make use of shop safety committees;
- (f) Establish chain-of-command principle in the Safety organization with proper authority and responsibility;

- (g) Disseminate information freely by means of meetings, bulletin boards, etc.
- (h) Institute local system of inspections, report, and records to insure a live, active, and continuing campaign.

4. A vigorous and continuing safety campaign embodying the above factors will produce results, but the Safety organization must be founded on sound principles, and there can be no let-up in vigilance and effort. Records are invaluable in the field of Safety Engineering and should serve to develop cause and remedies.

A.T. Church

By direction of the Assistant
Secretary of the Navy.

Distribution:

IX - attached list.

NAVY DEPARTMENT

WASHINGTON (25)

13 September 1943

SOSED-1D-904

RLM:MLB

From: The Assistant Secretary of the Navy,
(Shore Establishments Division).
To: Commandants and Commanding Officers, Naval Shore Establishments con-
cerned; Bureaus and offices, Navy Department.
Subject: Safety Engineering Inspection Schedule.
Enclosure: (A) Excerpts from Astsecnav orders, etc., issued to Mr. H. G. Des-
jardins, Senior Engineer (Safety).

1. Enclosure (A) is forwarded for the information of all concerned.
2. Commanding officers of establishments under inspection are requested to facilitate such inspections in every way possible. For example:
 - (a) Provide adequate clerical service,
 - (b) Facilitate the taking of photographs, subject to necessary security measures, either by the station photographers or by the inspecting engineer, of conditions pertaining to the safety inspection.
 - (c) Assist inspecting safety engineer as may be reasonable and desirable in matters of transportation.
3. Upon conclusion of each inspection, and before his departure, the inspecting engineer will prepare his report and leave a copy of same with the commanding officer of the station. This report will be in the form of an on-the-spot memorandum to the commanding officer, every item of which will be discussed with the appropriate station authorities. This procedure is based on the concept that the inspecting safety engineer reports to the commanding officer of each station inspected for service to that command and, as a temporary official of such command, submits his report by recommendatory memorandum to his commanding officer.
4. Copies of each memorandum inspection report will be forwarded by this office to Bureaus concerned.
5. The Assistant Secretary of the Navy desires that everything possible be done to correct unsatisfactory conditions and that the commanding officer of the station inspected forward within 60 days, via the Bureau having principal cognizance, a report indicating action taken on each recommendation. This report should be addressed to the Assistant Secretary of the Navy, (SED, Safety Engineering Section).

/S/ C. M. Simmers,
By direction.



WASHINGTON, D. C.

DO NOT ADDRESS TO SIGNER OF THIS LETTER
BUT ADDRESS YOUR REPLY TO
BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT, WASHINGTON, D. C.
AND REFER TO NO.

BUMED-Y-TPC
P2-4/LL(062-39)
10 Apr 1944

To: BuShips

Subj: Industrial Health - Survey of Respiratory Diseases.

Ref: (a) Your letter P2-4(768-G) to BUMED dated 24 Mar 1944.

1. The plan suggested in paragraphs 3 and 4 of Ref.(a) for a separate survey of the Navy Yards by Naval personnel will give us a valuable basis for comparison of health hazards when compared with the findings of the Maritime Commission survey.
2. As a result of the agreement reached by representatives of the Office of the Assistant Secretary of the Navy, Bureau of Ships, Maritime Commission, and the Bureau of Medicine and Surgery at the meeting held April 7th, 1944, plans are being formulated to make a survey in the Navy Yards. The date of completion of this survey will correspond with that of the Maritime Commission mentioned in paragraph 2(g) of Ref.(a).

L. Sheldon, Jr.
L. SHELTON, JR.
Rear Admiral (MC), USN
Acting Chief of Bureau

P2-4

768

4120789

ROUTE SLIP

3/11

7/8/57

Code of Originating Section

768

Initialed by

ALB

Date

3/11

SECTION CODE	INITIALED		REMARKS
	BY	DATE	
768	ALB	3/11	
760	R33	3/12	43 3/11
308	R	3/20	revised for
300	R	3/21	I discussed this with you about 1 mo. ago. R
801	①	3/22	Understand survey consists of about one hour's examination per
101	⑦	3/23	man. This is 127 lost man days and is concurred in. I would facilitate & recommend any appreciably greater survey involving extensive loss of time

2-144715

DATE—SERIAL NUMBER

ENCLOSURES

HW

SC

FILE

DATE

CROSS FILE

OK'D BY C. E. N.

FILE NO.

P2-4

22-4(780-6)

3-18-44
ALC-MLC

24 MAR 1944

To: Bureau of Medicine & Surgery

Attention: Captain T. J. Carter

Subj: Industrial Health - Survey of Respiratory Diseases.

Ref: (a) SecNav's ltr. 80522-12-CHS 2/27 1907 of March 4, 1943.
(b) SecNav's ltr. 80522-12-12H 921 4/22 of March 5, 1943.
(c) Conference on March 3, 1943 between representatives from the Bureau of Medicine & Surgery, Bureau of Ships, Secretary's Office, Public Health Service and Maritime Commission.

1. References (a) and (b) outline the joint Navy-Maritime Commission program for improvement of industrial health and safety in shipyards. As a step in furthering the program, the Maritime Commission has proposed a survey of respiratory diseases in shipyard workers. In reference (c), a discussion was had regarding the suggested survey.

2. The elements of the research, as outlined by the representative from the Maritime Commission in reference (c), are:

- (a) 5,000 shipyard workers to be examined, 1,500 from Maritime contract shipyards, and 1,500 from Navy contract yards.
- (b) The workers to be from different trades in the yard, with particular reference to those about whom occupational diseases little is known.
- (c) The research to be conducted by the Maritime Commission staff, in both Navy contract and Maritime contract yards.
- (d) The Maritime Commission to pay all expense of the research, except salaries of those employees examined in Navy yards.
- (e) The Maritime Commission to have the use of the medical staffs and equipment in those Navy contract yards in which research is conducted.

P2-4(768-G)

- (f) The Navy to receive the benefit of the findings based on the survey.
- (g) The survey to be concluded in approximately six months.

3. It is thought that the Navy can better contribute to this program if its share of the survey, the examination of 1,500 workers, is carried out in Navy operated Navy Yards, for these reasons:

- (a) Navy should have direct contact with this problem in its own yards from the beginning to the end and full control thereof.
- (b) Two surveys, proceeding in parallel, but correlated in their planning, execution and reports, would give two viewpoints and therefore be of benefit.
- (c) Little contractual, financial or management problems would arise in Navy operated yards, whereas considerable difficulties are anticipated in the plan outlined in paragraph 2.
- (d) The entire survey can progress more rapidly, as the Navy and Maritime examinations can proceed at the same time.

4. It is believed that a desirable arrangement would be for the Navy to conduct its surveys in a Navy Yard on each coast, with the Maritime Commission carrying on parallel research in nearby Maritime contract yards. In this way, collaboration and comparison as to methods and findings could be carried on before, during and after the periods of examination.

5. It is requested that the Bureau of Medicine and Surgery communicate to this Bureau its reaction to the above proposal.

Assistant Chief of Bureau
E. W. Mills

CC:
Capt. C. M. Simmers, Secy's Office
Dr. Philip Drinker, Maritime Commission

JOINT UNITED STATES NAVY - UNITED STATES MARITIME COMMISSION

SAFETY PROGRAM

PROGRESS REPORT

(January 1, 1943 - September 30, 1943)

Prepared by John M. Roche
Chief Safety Consultant
U. S. Maritime Commission
November 15, 1943

Approved by Daniel S. Ring, Director
Division of Shipyard Labor Relations
U. S. Maritime Commission
December 10, 1943

JOINT UNITED STATES NAVY - UNITED STATES MARITIME COMMISSION SAFETY PROGRAM

Progress

The accident frequency records of United States Navy and United States Maritime Commission contract shipyards continue to show a favorable trend. The joint cumulative frequency rate (the number of lost time accidents per million man-hours) for the nine months' period is 31.5.

The Navy Contract Shipyards shows a cumulative frequency rate of 28.5 as compared to a higher rate of 33.1 for the Maritime Yards covering the same period. (See curve and chart attached). The higher frequency in the Maritime Yards is partly accounted for by the fact that the majority are relatively new and consequently they did not have the benefit of an established organization.

The combined cumulative rate of 31.5 lost time accidents per million man-hours is a 16.9% improvement over the estimated 1942 rate of 37.91.

Inspections of Shipyards

	<u>Atlantic Region</u>	<u>Pacific Region</u>	<u>Gulf Region</u>	<u>Great Lakes Region</u>	<u>All</u>
No. Inspections	37	44	30	37	148
Days per Inspection	3.19	4.55	3.15	1.95	3.27
Safety Conferences Held	3	2	2	2	9
Safety Conferences Planned	--	--	1	1	2

Note: The above inspections were made over a period of approximately six months, beginning late in March 1943. Differences in the number of inspections made in various regions and the length of time per inspection is the reflection of the size of the yards inspected, the concentration of shipyards in certain areas, and the travel conditions in the region.

Without exception, every regional safety consultant has done a good conscientious job. The declining accident frequency rate shows that their work has been along the proper lines and that their duties have been efficiently carried out.

1944 Program

While the accident frequency rates so far in 1943 show that satisfactory progress is being made, it is evident that far better

performance is possible. The average peacetime accident frequency rate for a shipyard having a good accident prevention program should not exceed 25 lost time accidents per million man-hours.

Projects already under way that will be useful in reaching this goal include:

1. A study that is being made of accidents to women shipyard employees to determine what special precautions or training are necessary.
2. A study that is being made of lost time due to first-aid cases; that is, the time lost going to and from the first-aid station, and the time taken for treatment. It is estimated that the average time closely approaches one hour per case, and since the frequency of cases is practically one per man per month, it can be seen there is a potential loss of 10,000,000 man-hours.
3. Health and Safety Bulletins on pertinent accident prevention subjects that will be prepared and sent to all yards as in the past.

Further specific action designed to control the yards having higher than average accident frequency rates will be as listed below. These procedures are already in effect.

1. Yards having higher than average accident frequency records will be subjected to special study by the regional safety consultant and proper corrective action will be recommended. While yards having good records will not be entirely neglected, concentration of effort will be on the poor yards.
2. All yards developing records of lost time eye injury cases over the average for the industry will receive special attention. Also, the problem of eye injuries generally will continue to be attacked by every means at our disposal.

Recommendations

A careful analysis of the accident records of all yards backed up by the safety programs of most of the shipyards now operating shows that certain specific things must be done to further improve the frequency records and reduce the number of man-hours lost from accidents. The following recommendations embrace a Five-point program to be stressed during 1944. It is urged that official approval be given these recommendations:

1. Since a study of accident records indicates that one of the principal causes of accidents and alleged occupational illnesses is lack of proper safety training of shipyard employees, a definite minimum standard for the effective correlation of safety and craft training should be prepared and promulgated. This material should be prepared jointly by the Chief Safety Consultant, the Chief Health Consultant, and the Supervisor of Shipyard Training of the United States Maritime Commission.
2. Improper methods of handling material and poor house-keeping are responsible for 36.5% of all lost time accidents. A sound film strip on "Handling Material" at a cost of approximately \$3500 or less, should be produced to aid in the intensified drive on these types of accidents. This sound film strip, a copy of which will be made available to each yard, will be invaluable in connection with special posters, health and safety bulletins, trade publication articles, and other allied material in reducing the number of such injuries. It is asked that this proposed expenditure be approved and funds be made available.
3. Greater cooperation should be secured from the individual shipyard employee in the observance of yard safety rules. An attempt should be made to secure this better cooperation through the various unions of which employees are members.
4. It is again recommended that corollary consideration be given to the safety record of shipyards otherwise qualifying for the Maritime "M" award or the Navy "E" award. It is the practice of the Corps of Engineers, United States Army, to withhold awards where the safety record of a contractor is not at least as good as the average for industry.
5. Special safety citations should be awarded shipyards doing an outstanding safety job.

Note: The National Safety Council, Chicago, Illinois, has agreed to make funds available to defray the cost of special safety awards in the form of a suitably marked safety flag bearing the Universal safety emblem. The award is to be made by a committee of three, one chosen from the United States Maritime Commission, one from the United States Navy and one from the National Safety Council. The award will be based on the accident record of the shipyard and the degree of compliance with the minimum requirements for safety and health of contract shipyards.

Comments

The progress made so far has been as a result of the cooperation of all interested agencies of both the United States Maritime Commission and the United States Navy, Shore Establishments Division, and Bureau of Ships. Special thanks is due, however, to the Bureau of Labor Statistics, United States Department of Labor, where the statistics that make possible the efficient utilization of the time of Regional Safety Consultants were prepared, and to the National Safety Council, Inc., of Chicago, Illinois, which produced the sound film strip "Eyes for Victory," conducted the Victory Shipbuilding Safety Contest and prepared special posters.

(Sgd.) JOHN M. ROCHE
John M. Roche
Chief Safety Consultant
United States Maritime Commission

APPROVED:

(Sgd.) DANIEL S. RING
Daniel S. Ring, Director
Division of Shipyard Labor Relations
United States Maritime Commission

U.S. NAVY-U.S. MARITIME COMMISSION SELF-PAID ACCIDENT PREVENTION PROGRAM
ACCIDENT CAUSE ANALYSIS
JANUARY 1, 1943 TO SEPTEMBER 30, 1943

UNSAFE PRACTICE OR CONDITION	NUMBER OF REPORTED INJURIES				TOTAL	PER- CENT- AGE
	ATLANTIC	GULF	PACIFIC	GR. LAKES		
(a) Lack of goggles or screens- eye injuries only	2,512	2,382	3,448	639	8,981	18.76
1. No impact goggles	1,412	1,100	1,420	189	4,121	
2. No antiflash goggles	361	659	512	100	1,632	
3. No welding screens	351	44	71	13	479	
4. No welder's hood	50	86	36	7	179	
5. Other (specify)	338	493	1,409	330	2,570	
(b) Improper method of handling material	2,299	2,494	4,423	539	9,755	20.38
1. Lifting with bent back, poor grip, etc.	614	530	911	119	2,174	
2. Insufficient help in lifting	541	515	730	108	1,894	
3. Failure to use crane, hoist	126	418	241	15	800	
4. Failure to wear safety shoes	329	335	819	126	1,609	
5. Failure to wear gloves	282	329	948	40	1,599	
6. Other (describe)	407	367	774	131	1,679	
(c) Poor housekeeping resulting in falls	2,341	1,452	3,413	531	7,737	16.17
1. Unguarded hatches, holes, pits	370	275	470	20	1,135	
2. Defective ladders, staging, etc.	413	243	440	80	1,176	
3. Unsafe use of ladders, staging	542	252	763	109	1,666	
4. Poor housekeeping generally	593	318	792	187	1,890	
5. Other (specify)	423	364	948	135	1,870	
(d) Poor housekeeping-all other injuries	948	735	1,935	165	3,783	7.90
1. Poor layout	132	137	669	48	986	
2. Poor housekeeping generally	605	478	556	76	1,715	
3. Other (specify)	211	120	710	41	1,082	
(e) Improper condition or use of hand tools	542	531	996	80	2,149	4.49
1. Unsafe condition of hammers	38	152	103	6	299	
2. Unsafe use of hammers	166	112	239	30	547	
3. Defective chisels-hand & air	36	43	66	13	158	
4. Unsafe use of chisels-hand & air	83	95	172	31	381	
5. Other (specify)	219	129	416	--	764	
(f) Improper condition or use of welding and cutting tools (ex. eye inj.)	577	485	594	76	1,732	3.62
1. Lack of ventilating equip.	127	114	83	26	350	
2. Improper use of ventilating equipment	45	76	36	6	163	
3. Defective cables of electric welding equipment	24	20	14	0	58	
4. Defective electric welding equipment	14	57	42	8	121	

U.S. NAVY-U.S. MARITIME COMMISSION SHIPYARD ACCIDENT PREVENTION PROGRAM

- ACCIDENT CAUSE ANALYSIS

JANUARY 1, 1943 TO SEPTEMBER 30, 1943

Page 2 (Continued)

UNSAFE PRACTICE OR CONDITION	NUMBER OF REPORTED INJURIES				TOTAL	PER-CENT-AGE
	ATLANTIC	GULF	PACIFIC	GR. LAKES		
5. Improper use of electric welding equipment	82	51	104	10	247	
6. Defective gas welding or cutting equipment	39	23	43	4	109	
7. Improper use of gas welding or cutting equipment	107	64	95	4	270	
8. Other (specify)	139	80	177	18	414	
(g) Improper placing or piling causing falling objects	630	614	974	97	2,315	4.84
1. Placing insecurely on staging	260	266	320	19	865	
2. Placing insecurely on stock-piles	212	207	194	30	643	
3. Other (specify)	158	141	460	48	807	
(h) Defective or unsafe use of machinery	230	218	544	55	1,047	2.19
1. Unguarded power presses	10	2	29	6	47	
2. Unguarded or defective abrasive wheels	21	25	128	7	181	
3. No goggles or shields when using abrasive wheels	25	21	92	3	141	
4. Failure to adjust rest-abrasive wheels	23	17	60	2	102	
5. Defective or unguarded shears, rolls, brakes	43	42	41	6	132	
6. Other (specify, as overhead cranes, etc.)	108	111	194	31	444	
(i) Defective or unsafe use of cranes and hoisting equipment	491	333	745	884	1,657	3.46
1. Defective slings	18	44	53	6	121	
2. Defective pads, rings, clamps	44	64	41	13	162	
3. Unsafe hooking or rigging of load	156	117	253	33	559	
4. Standing under or near suspended load	148	84	221	12	465	
5. Other (specify)	125	24	177	24	350	
(j) Improper protection against spray painting	10	43	33	2	88	0.18
(k) Improper protection against sand blasting	76	139	98	0	313	0.65
(l) All Others.	3,501	1,825	2,393	525	8,504	17.35
TOTAL	14,157	11,311	19,596	2,797	47,861	

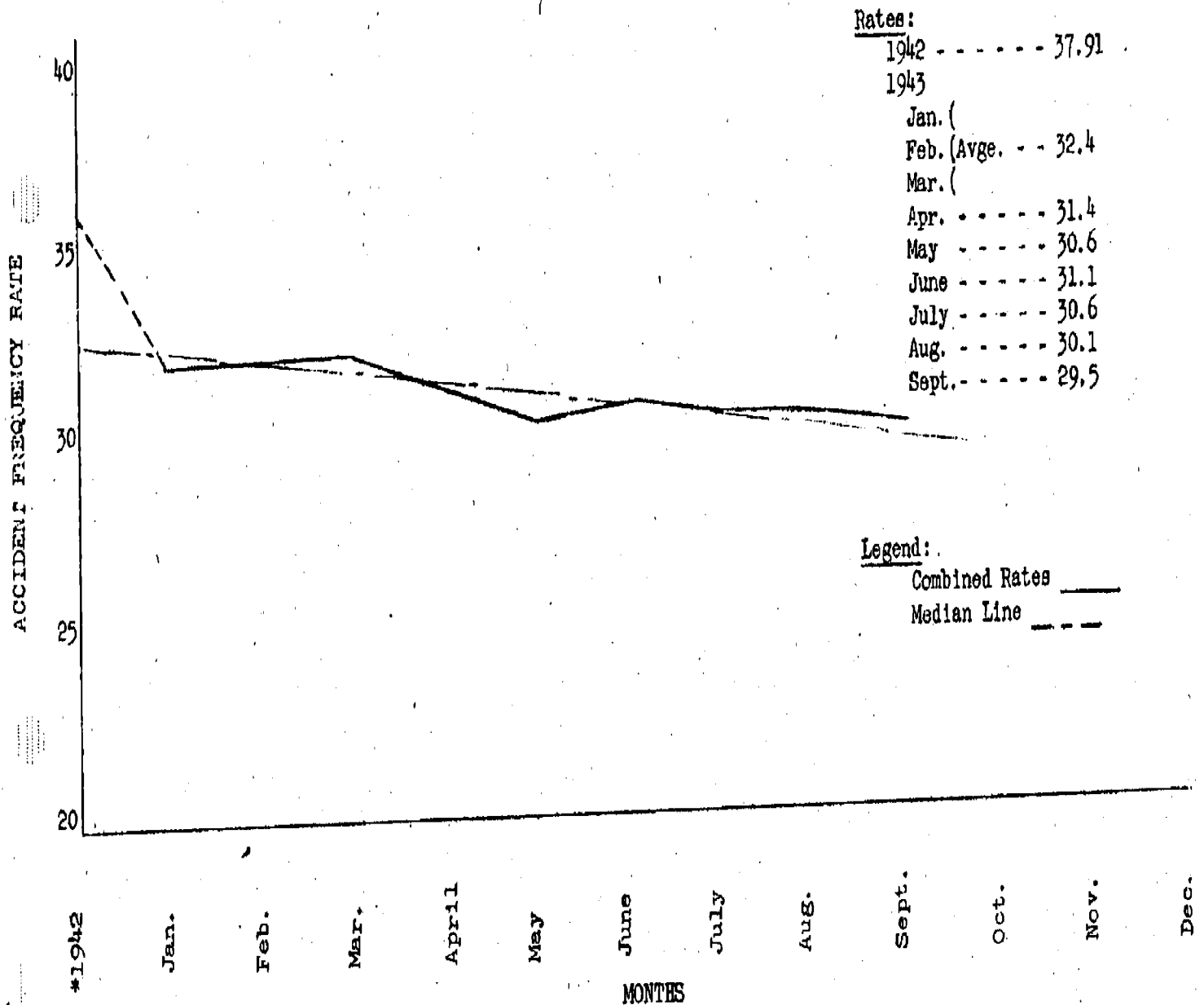
SUMMARY OF INDUSTRIAL-INJURY FREQUENCY RATES BY MONTH, AND 1943 TO DATE FOR THE
U.S. MARITIME COMMISSION-U.S. NAVY DEPARTMENT SAFETY PROGRAM

MONTHS OF 1943								
	1st Quarter (Jan.-Feb.-March)	April	May	June	July	August	September	October November December
Combined USMC Navy Rates By Month	32.4	31.4	30.6	31.1	30.6	30.1	29.5	
U.S.M.C. By Month	32.5	31.5	33.0	33.6	32.6	32.5	30.9	
Navy Dept. By Month	32.2	31.3	26.0	25.7	27.1	25.8	27.3	
1943 Cumula- tive USMC Navy Rates	X	32.0	31.4	32.2	31.9	30.3	31.5	
U.S.M.C. Cumulative	X	33.1	33.0	34.1	34.3	32.0	33.1	
Navy Dept. Cumulative	X	30.1	28.2	28.1	27.5	27.0	28.3	

ACCIDENT FREQUENCY RECORD

Joint U. S. Navy - U. S. Maritime Commission Health and Safety Program

(Combined Frequency Rates - Navy and Maritime Yards - 1943 vs 1942)



*1942 Rate Estimated from U. S. Dept. Labor and National Safety Council Figures

JMR - 11/20/43

A HEALTH SURVEY OF PIPE COVERING OPERATIONS IN CONSTRUCTING NAVAL VESSELS

by

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An industrial health inspection of an important Navy Contract Yard, the Bath Iron Works (1) of Bath, Maine indicated that dustiness from miscellaneous pipe covering operations was considerable and a few of the employees had what appeared to be asbestosis. This is a well-known industrial disease caused by only one thing--prolonged breathing of asbestos dust. The clinical manifestations are shortness of breath and an unusual chest picture by x-ray. In industry the disease is often disabling, but it is much less frequent than silicosis, with which it very properly is classed.

It was not felt that experience in a single yard was enough to justify any general statements on working conditions in other yards, and certainly was no cause for alarm, but the results warranted check-ups elsewhere. Accordingly, at the direction of the Bureau of Ships (2) arrangements were made to examine by chest x-ray the pipe coverers in two Navy Yards, Boston and Brooklyn, and two contract yards, Bethlehem Fore River and New York Shipbuilding Corporation. Permission was obtained to use dust exposure data from the U. S. Navy Yard, Portsmouth, N. H. Examinations were made of the working conditions including dust counts of the air breathed and microscopic and chemical analysis of the dust itself.

We would point out that this procedure is the customary one in making such surveys of occupational diseases--medical examination of the workers and a study of the nature and concentration of the contaminants in the air breathed. This report is a digest of our findings.

History of Amosite

Amosite, a magnesium iron silicate of variable composition, is the generic name for an asbestos fibre mined in Rhodesia, South Africa.

The obvious 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°, as compared to magnesia with a weight of 16 pounds per cubic foot, with a temperature limit of 500°. 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 a 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 the War.

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 a type was developed 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 provide handling ability and reduce the dust, which the water-repellent agent made more prominent than in other amosite products.

I. Description of Operations and Working Environment

Asbestosis results from breathing asbestos fibers of relatively long length, such as 15 to 75 microns. It is not caused by breathing chopped up asbestos fibers of one or two microns as has been very clearly demonstrated by Dr. L. U. Gardner (3) of the Saranac Laboratories. Therefore we are concerned with the presence in air of asbestos fibers which can be seen as such under low power of the ordinary microscope.

But the clinical picture can easily be complicated by the presence of diatomaceous earth, a form of amorphous silica, which can cause silicosis and is probably a more serious health risk than asbestos.

Another dust which may be present is magnesia, MgO , which is in very common use as a heat insulator and is harmless.

Therefore our analyses, Section IV, are done to indicate how much fibrous type of asbestos dust is present in the air breathed, how much silica is present (especially as diatomaceous earth), and how much of the harmless ingredients like iron oxide and carbonates.

There are frequent references in this report to the use of "approved respirators." The approval is given by the U. S. Bureau of Mines for industrial dust respirators which are intended to be worn under just such conditions as those we depict to protect the wearer against inhaling harmful quantities of dusts such as asbestos and silica. Respirators are never popular with workmen because if they are effective they always offer a slight resistance to breathing. But they do prevent dust inhalation and they can be and actually are used in preventing dust inhalation in many plants today. Both Navy and Maritime Commission have approved the use of dust respirators for special jobs in shipyards.

Pipe covering may be divided into seven different operations as follows:

1. Laying out and cutting
2. Band saw cutting
3. Sewing and preparation of boots and jackets
4. Cement mixing
5. Molding
6. Grinding
7. Installation on board ship

1. Laying out and cutting

Rolls of asbestos insulating felt are unwrapped and unrolled on a large layout table or on the floor of the shop. This material, with the exception of the type known as water repellent amosite, is then well wetted with a water spray. The material is marked into measured sections and cut with a rotary electric hand saw. The cut sections are rolled up and either used or stacked in the storeroom.

Usually one to three workers are employed at this operation. During the handling, unwrapping and unrolling of the asbestos, considerable dust arises but appears to settle readily. A very fine water spray should be used for wetting down the material as a high velocity spray will stir up dust. Once wetted the handling and cutting of the material gives rise to little visible dust. All of the yards wet down the asbestos as described above.

The Brooklyn Navy Yard has an elaborate exhaust system for the layout table. The entire top of this table is covered with small perforations through which the air is exhausted. This table is sufficiently large that no more than two-thirds of the top is ever covered with material and room air is thereby

exhausted through the other third. While no velocity or capacity measurements were made on this system, data presented later in the report indicate that this control measure had a marked effect in reducing the dust count.

2. Band saw cutting

A standard band saw such as is found in woodworking shops is used to cut asbestos insulation blocks and boards into desired shapes. This operation gives rise to large amounts of air-borne dust, most of which settles slowly. Normally there is only one worker on this operation at any one time.

Inasmuch as this is a very dusty operation, the band saw should be enclosed in a room by itself and should be equipped with adequate local exhaust ventilation both above and below the saw table. Because of the mechanical difficulties in locating this exhaust properly, some of the dust will escape into the air and the operator should therefore wear an approved dust respirator.

3. Sewing and preparation of boots and jackets

In this operation jacket covers for valves and pipe joints are fabricated. The work consists of cutting asbestos cloth with shears, padding the jackets with amosite or other insulating material, and sewing with wire or asbestos cord. These operations give rise to only slight amounts of visible dust and exhaust ventilation and respiratory protection are neither required nor used. There is usually a large number of workers doing this operation in one large room.

4. Cement mixing

For protection and to give a neat appearance the insulation on board ship is usually covered with cement containing a high percentage of asbestos fibers. In mixing, the proper amount of water is added to the dry asbestos cement and thoroughly agitated with a hoe. Occasionally small amounts of asbestos cement are mixed in a pail with a trowel. Considerable dust is raised when the asbestos

cement is dumped into the mixing trough and during the early stages of mixing. Ordinarily this process is done in a separate room and only one operator is exposed. The dustiness of this operation warrants the use of exhaust ventilation or respiratory protection or both, although neither is generally used.

Petrographic analyses of asbestos cement indicate that the amount of diatomaceous earth may be as high as 87% by count.

5. Molding

Molding is the process of building up asbestos insulation to fit odd shapes of boilerwork and piping. A form is made to the exact shape of the machinery to be insulated. Block insulation is laid on, adjoining sections glued together, exposed surfaces sealed with asbestos cement and the whole mold covered with asbestos cloth. When dry, the molded insulation can be lifted off the form and is ready to be installed on board ship. This operation is usually done in the shop next to the sewing operation. Very little dust is produced from this operation and no special ventilation or respiratory protection is required.

6. Grinding

Several shipyards reclaim their scrap pieces of prefabricated sections of asbestos insulation by grinding up this material and using it in the asbestos cement, all of which contributes considerable dustiness. Normally this job is done at infrequent intervals and only one or two men are exposed, but the operation should be isolated, general room exhaust supplied and approved dust respirator worn by the operator.

7. Installation of pipe covering on board ship

There are a number of operations involved in pipe covering on board ship. Amosite felt is wrapped and pounded tightly around large pipes and joints and fastened firmly in place with wire or asbestos cord. Pipes and boilers are

covered with prefabricated sections, which necessitates some hand sawing to fit the sections. Ready mixed cement is applied to fill in spaces and give a smoother finish. Some insulation is wrapped with glass cloth or asbestos cloth for greater strength. The only operations that produce much dust are the wrapping and pounding of amosite and the sawing of sections.

Nearly all of the compartments on board ship are involved in this work, although most of it is concentrated in the machinery spaces. Usually the greater number of pipe coverers work on board ship and relatively few men in the shop. The spacing of workers ranges from one or two men doing a small job in a living space to as many as twenty or thirty men working on ten or more jobs in the engine room. Temporary exhaust ventilation is seldom used on board ship for pipe covering and very few of the workers wear respirators.

Because of the varied nature of pipe covering operations in ship compartments, general exhaust ventilation is to be preferred. If the compartment is large, such as the main engine room, five air changes per hour are needed. In small compartments, such as living spaces, ten to fifteen air changes per hour are required.

II. Materials Used

A. Amount

A tremendous amount of asbestos insulation is used on modern naval ships. To give a general idea of the increase in asbestos pipe covering operations on major naval ships in recent years, Table I was compiled. The table starts with 1932 since high percentage asbestos insulation came into use at that time. The table covers only new construction although several yards did considerable repair work which included pipe covering. Since the dates given in the table are those of commissioning, the pipe covering work preceded these dates by one or two years. The listings for 1943 and 1944 are probably not complete and some of the listings for these years were estimated from the dates of launching. The information in this table was taken from "The Ships and Aircraft of the U. S. Fleet" by James C. Fahey. (5)

In Table 2 is given a summary of the amounts of asbestos insulation materials used in each of the shipyards during an average month.

TABLE I

YEAR	BOSTON NAVY YARD	BROOKLYN NAVY YARD	PORTSMOUTH NAVY YARD	NEW YORK SHIPBUILDING	BETHLEHEM FORE RIVER
1932			1 Submarine	1 Cruiser H	
1933			1 "		1 Cruiser H
1934		1 Cruiser H		1 " H	1 Destroyer
1935	2 Destroyers	2 Destroyers	2 "		
1936	2 "		1 "	3 Destroyers	1 Cruiser H 4 Destroyers
1937	2 "	1 Cruiser L	6 "	1 "	1 Cruiser H 2 Destroyers
1938		1 "	1 "	3 Cruisers L	
1939		1 "			
1940	6 Destroyers		2 "		1 Carrier 2 Destroyers
1941	2 "	1 Battleship	3 "		
1942	6 "		8 "	1 Battleship 4 Cruisers L	1 Battleship 2 Cruisers L 6 Destroyers
1943	5 " 25 Destroyer Escorts	1 "	3 "	8 Carriers L 1 Cruiser L	3 Carriers 4 Cruisers H 1 Cruiser L 12 Destroyer Escorts
1944	6 Destroyers	1 " 2 Carriers	3 "	1 Carrier L 2 Cruisers H	1 Carrier 1 Cruiser H 2 Cruisers L

H denotes Heavy

L denotes Light

TABLE 2. SUMMARY OF MATERIALS USED AT EACH YARD PER MONTH

	New York Ship	Fore River	Brooklyn	Portsmouth	Boston
Amosite	40,000 sq. ft.	6,325 sq. ft.	50,000 sq. ft.	2,000 sq. ft.	58,200 sq. ft.
Amosite (water-repellent)	-	3,300 sq. ft.	15,000 sq. ft.	-	-
Prefabricated Sections (molded and block)	1,750 sq. ft. 18,800 linear ft.	15,700 linear ft.	1,200 sq. ft. 115,000 linear ft.	260 sq. ft.	600 sq. ft. 39,900 linear ft.
Asbestos cloth	34,700 sq. ft.	40,000 sq. ft.	106,600 sq. ft.	-	76,500 sq. ft.
Metallic Twine Asbestos Yarn	-	-	150 lb.	-	-
Asbestos paper	4,000 sq. ft.	5,500 sq. ft.	5,500 sq. ft.	-	-
Asbestos board	150 sq. ft.	-	6,000 sq. ft.	-	2,700 linear ft.
Asbestos cement	57,500 lb.	38,500 lb.	15,000 lb.	120 lb.	34,400 lb.

B. Composition of Materials Used

According to Navy Specification 32 F 3, the rovings of asbestos insulating felt (amosite) shall contain not less than 95% asbestos fibre of the following composition:

Silica (SiO_2) percent minimum.....47.5
Iron oxide (Fe_2O_3) percent maximum.....45.0
Magnesium oxide (MgO) percent minimum....6.0

Typical analysis of the two types of asbestos fibres in general use are tabulated below:

	<u>Chrysotile</u>	<u>Amosite</u>
Silica (SiO_2).....	39.05%	50.24%
Magnesia (MgO).....	40.07%	3.96%
Alumina (Al_2O_3).....	3.67%	
Ferric oxide (Fe_2O_3).....	2.41%	7.80%
Ferrous oxide (FeO).....		32.00%
Sodium oxide (Na_2O).....		2.12%
Combined water (H_2O).....	14.48%	3.00%

Therefore amosite alone will not comply with Navy Specifications because of the low magnesia content and must be mixed with chrysotile asbestos to equal or exceed the 6.0% minimum value for magnesia. On the other hand, chrysotile cannot be used alone because of its silica content which is below the minimum 47.5% specified by the Navy. The two types of asbestos fibres must be mixed together in the proper proportions to satisfy the values set

for magnesia and silica. The amounts of these materials used to form this mixture therefore would be 6 - 43% chrysotile asbestos and 94 - 57% amosite asbestos.

Those two fibres differ mainly in their physical characteristics. Chrysotile is capable of being readily separated into very fine fibres with a soft silky feel, whereas amosite is harsher and requires more manipulation to fiberize it. One authority has stated that the chrysotile has the finest individual fibres, and amosite the coarsest. Because of this difference we may suspect a decided decrease in the number of respirable fibres (below 200 microns in length and 5 microns in diameter) whenever amosite is used in preference to chrysotile asbestos.

III. Pipe Covering Facilities at Individual Shipyards

A. U. S. Navy Yard, Brooklyn, N. Y.

There are 50 men working in the shop and 700 men on board ship.

The shop is divided into four main rooms: Layout, Sewing, Cement, and Storage and Band saw combined. With the exception of the Cement Room, the doors between these rooms are normally left open.

The work in the Sewing Room consists mostly of fabricating and sewing valve boots and jackets. All the cement used on board ship is mixed in the Cement Room. There is no exhaust ventilation for either the Sewing or Cement Room. The bandsaw is equipped with a flexible exhaust tube above the table and an exhaust around the blade below the saw table. The layout table is equipped with exhaust ventilation as described above. There is no exhaust ventilation supplied on board ship for pipe covering and no workers were found wearing respirators.

B. U. S. Navy Yard, Boston, Mass.

There are 84 men working in the shop and 467 men on board ship. The shop is divided into two rooms, one of which is primarily for storage and occasional grinding and band saw cutting operations. The only mechanical exhaust ventilation in the shop is provided for the grinding, mixing and band saw cutting operations and is inadequate. In the other room layout, cutting and sewing are done with a small amount of space for storage. Cross draft ventilation is provided by open windows on both sides of the room.

Work on board ship is not supplied with exhaust ventilation.

No asbestos workers were found wearing respirators.

C. U. S. Navy Yard, Portsmouth, N. H.

There are 5 men in the shop and 35 men working on board ship. The shop consists of one large layout room with two smaller cubicles, one for sewing and one for cutting and issue, separated from the main layout room by chicken wire partitions. A small exhaust hood is used in the layout room to exhaust cork cementing operations only. All other ventilation is natural draft. There is a small room in another building where band saw operations are done. The band saw operator is the only worker wearing a respirator. Most of the asbestos insulation is kept in a stock room in a third building.

D. Bethlehem Steel Co., Fore River Yard, Quincy, Mass.

There are 8 men in the shop and 160 men working on board ship. Pipe covering operations are done in two shops. In the main one, boots and jackets for pipe valves and connections are fabricated and surplus material is stored. In the smaller shop, layout and cutting of amosite, water repellent amosite and fire felt is done. There is no exhaust ventilation in either shop nor for the pipe covering operation on board ship. All the asbestos cement is mixed in a compartment on board ship. The only worker who wears an approved dust respirator is the man who cuts the two types of amosite. There is no band saw cutting of asbestos in this yard.

E. New York Shipbuilding Corp., Camden, N. J.

There are 51 men working in the shop and 123 on board ship. Layout, cutting and cement mixing are done at one end of the shop. Dust respirators are occasionally worn during these procedures. At the other end of the shop

TABLE 6. RELATIONSHIP BETWEEN LENGTH OF EXPOSURE AND INCIDENCE OF ASBESTOSIS

SHIPYARD	Years in Pipe Covering Industry			
	0 - 2	2 - 5	5 - 10	10 Plus
(Exposed Boston(Affected (Percentage	24 0 0%	13 0 0%	8 0 0%	3 0 0%
(Exposed Brooklyn(Affected (Percentage	225 0 0%	435 0 0%	67 0 0%	22 0 0%
(Exposed Fore River(Affected (Percentage	26 0 0%	118 0 0%	5 0 0%	9 2 22%
(Exposed New York Ship(Affected (Percentage	0 0 0%	105 0 0%	45 0 0%	17 1 6%

VI. Summary and Conclusions

1. The data in Tables 3 and 4 indicate that hand saw cutting, cement mixing and installation on board ship are the dustiest operations.

2. The above 3 operations should be equipped with exhaust ventilation to keep the total dust concentration low. Such dust control will greatly facilitate good housekeeping in pipe covering operations.

3. The incidence of asbestosis found was low - 0.29% (3 cases out of 1074 x-rayed). Since each of these 3 men 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 occupation.

4. The excellent exhaust ventilation supplied to the layout and cutting table at Brooklyn decreased markedly the dustiness of this operation.

5. Since water repellent amosite cannot be wetted, exhaust ventilation should be supplied during laying out and cutting of this material.

ACKNOWLEDGEMENTS

We should like to express our appreciation for their excellent cooperation to the Supervisors of Shipbuilding at New York Shipbuilding Corporation and Bethlehem Steel Company, Fore River; to the Yard Medical Officers and Medical Officers for Industrial Hygiene at the Boston, Brooklyn and Portsmouth Navy Yards and to the Medical Directors at Bethlehem Steel Company, Fore River and New York Shipbuilding Corporation.

We are indebted to Lieut. J. E. Fuller H(S) USNR, Portsmouth Navy Yard and to Lieut. J. Ege H(S) USNR, Boston Navy Yard for allowing us to use data from their studies on the dust hazard in pipe covering operations in their respective yards.

We should like to thank Dr. Charles R. Williams of Liberty Mutual Insurance Company for doing the petrographic analyses of settled dust samples and Mr. Charles Day of the Union Asbestos and Rubber Company for supplying the information on the development of amosite pipe covering in shipyards.

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