

P2-4 (G-2)
No.

NAVY YARD, NEW YORK

MEDICAL DIVISION February 19, 1943

From: The Industrial Health Officer.
To: The Assistant Secretary of the Navy.
Via: (1) The Medical Officer of the Yard.
(2) The Commandant, Navy Yard, New York, N. Y.
(3) The Commandant, THIRD Naval District.
(4) The Chief of the Bureau of Medicine and Surgery.

Subject: Industrial Health Program -- Survey of Activities and Reporting of.

Reference: (a) SecNav's ltr SOSED-1D-LMB SO 114 1008 - P2-4 dated November 28, 1942.

Enclosure: (A) Report entitled "Industrial Hygiene Survey, Navy Yard, New York, N. Y.

1. Enclosure (A) is hereby respectfully submitted in accordance with instructions contained in reference (a).

L. J. GOLDWATER.

Industrial Hygiene Survey, Navy Yard, New York, N. Y.

Introduction

The information which forms the basis for this report has been derived from four main sources: (1) a study of the files of the Supply Officer to determine what potentially harmful materials are being requisitioned by the various shops; (2) inspections and surveys conducted in the shops; (3) analysis of the case histories of civilian employees who, because they were suspected of suffering from an occupational disease, were referred to the Industrial Health Officer for examination; (4) the results of periodic examinations of specific occupational groups.

The New York Navy Yard is one of the larger shore establishments. According to the records of the Accounting Officer the total civilians on the payroll as of December 30, 1942 numbered 64,479, of which about one fifth were clerical and four fifths labor. The distribution of these employees by trade is shown in Table I. The number of civilians employed was practically trebled during the year 1942 but the relative numbers in the various shops maintained a fairly constant ratio. In other words, most of the shops exhibited relatively the same rate of growth. In calculating some of the rates used in this report a uniform rate of growth has been assumed.

Location and Nature of Occupational Disease Hazards

This information can best be presented by enumerating the pertinent data shop by shop. Only those materials and processes considered to be of significance will be mentioned. A complete tabulation of potentially harmful substances is given in Appendix A.

1. Fuel Plant, Shop 01. Benzol, carbon tetrachloride, metallic mercury, caustic soda, cresol, various paints, lacquers and driers. These materials are handled and stored, but not actually used in the Fuel Plant. Leaking or ruptured drums and containers constitute a potential health hazard but one which has not become manifest.
2. Central tool Shop, Shop 06. Abrasive wheels constitute the principal potential health hazard.
3. Material Laboratory, Shop 09. Cutting oils, abrasive wheels, benzol and various paints, lacquers and thinners. Flame testing of cables and the handling of numerous materials for testing give rise to many health hazards.
4. Shipfitter Shop, Shop 11. Cutting oils, abrasive wheels, metallic mercury, cresol, various cements, lacquers, paints, thinners, varnishes and driers, welding electrodes of varied composition and with varied coatings, acetylene, hydrogen and other compressed gases. The health hazards associated with electric arc welding far overshadow any other occupational health problem at this Yard. Burns and eye

injuries (flashes) constitute a major part of the accidents and the inhalation of welding fumes is by far the greatest cause of occupational illness. As will be shown later, welding fumes affect not only the shipfitters and welders, but also many other trades and constitute the outstanding cause of occupational disease morbidity. Closely related is the hazard created by acetylene cutting and burning.

5. Sheetmetal Shop, Shop 17. Cutting oils, fibrous glass and asbestos insulating materials, abrasive wheels, solder and rubber cements.
6. Forge Shop, Shop 23. Excessive heat and variations in temperature are the main health hazards.
7. Machine Shop, Shop 31. Cutting oils, abrasive wheels, lead, benzol, carbon tetrachloride, paints, lacquers, thinners and driers. Oil dermatitis is the principal health hazard.
8. Ordnance Machine Shop, Shop 36. Same as Shop 31.
9. Outside Machine Shop, Shop 38. Same as Shop 31 and 36. The outside machinists are among the trades indirectly affected by welding fumes (See Shop 11).
10. Electric Shop, Shop 51. Cutting oils, cables, abrasive wheels, benzol, carbon tetrachloride, lacquers and varnishes. The principal health hazards arise from working adjacent to welders and from handling cable containing chlorinated naphthalenes and diphenyls.
11. Coppersmith Shop, Shop 53. Lead, abrasive compounds, acids.
12. Pipe Shop, Shop 56. Abrasive wheels, refrigerant gases, rubber cements, paints and lacquers.
13. Pipe Coverer and Insulating Shop, Shop 58. Asbestos, adhesives, fibrous glass and related insulating materials.
14. Joiner and Shipwright Shop, Shop 61. Exotic woods, abrasive wheels, carbon tetrachloride, rubber cements, paints, driers and paint removers, fibrous glass and adhesives. Fibrous glass dust, and fumes from xylol or carbon tetrachloride in the adhesives constitute the principal health hazards.
15. Paint Shop, Shop 71. Numerous paints, lacquers, thinners, driers, paint removers, fire and gas proofing compounds, insecticides.

16. Public Works, Shop 79. Cutting oils, lead, benzol, carbon tetrachloride, paints, lacquers, thinners, paint removers.
17. Foundry, Shops 82 and 85. Silica sand, parting compound, lime, abrasive wheels lead, magnesium, manganese, zinc. The principal hazards arise from dust and from metallic fumes.

The lists of materials obtainable through the central files of the Supply Officer do not cover all hazardous materials used in the Yard. Some of the shops procure proprietary and open purchase items, some of which have been found to be injurious to health. It is practically impossible to maintain a complete file on these materials.

Effects of Exposure on Health and on Production

- A. Information obtained in periodic examination of specific occupational groups.

The periodic examinations performed during the year 1942 on civilians engaged in potentially hazardous trades are shown in Table II. With the exception of two men employed at the Clothing Impregnation Plant and exposed to tetrachlorethane, nothing was found to indicate that any worker in any of these trades was suffering from the results of the specific exposure. These two men were found to have enlargement of the liver and were transferred to other work. At the present time a survey is being conducted among electricians who handle cable which is impregnated with chlorinated cyclic hydrocarbons. Early indications are that an appreciable number will be found to have the so-called halowax dermatitis or chloracne. Those so affected will be removed from this exposure.

- B. Analysis of cases sent to the Industrial Health Office because of suspected occupational disease.

Accurate records of all cases referred to the Industrial Health Office have been kept since September 1, 1941. From then until December 31, 1942 a total of 792 cases were seen. When these cases are classified as to type of hazard responsible it is found that a majority were due to one of five agents. The five principal causes of morbidity are given in Table III, along with the number of cases attributed to each. It will be noted that only 307 (38.8%) of the cases referred were considered by the Industrial Health Officer to be truly industrial in origin although all 792 were seen because the employee or a medical officer had thought that there was a possibility of occupational illness being present. In the non-industrial group there was a relatively large proportion of cases in which no definite health hazard could be held in suspicion. These cases ranged literally from Acne to Zoster.

An analysis of the 307 cases of industrial illness by occupation and type of hazard is given in Table IV. It can be clearly seen in Table III and IV that the greatest cause of morbidity has been welding fumes and that many trades besides welders are affected. The second most common cause of

industrial illness is skin irritants which of course embraces a wide variety of substances. Electric cable, causing the so-called Halowax dermatitis was the most frequent offender.

The frequency with which industrial illness occurred in the various shops is not necessarily a true measure of morbidity because of the wide differences in the numbers employed. True morbidity rates can be calculated either on the basis of average number of employees per shop or better still on the basis of man hours. The latter is considered preferable since it gives the time of potential exposure. A man who works ten or twelve hours a day obviously runs a greater risk of developing an occupational disease than one who works only eight hours. The morbidity rates for the various shops are given in Table V. Morbidity above the general average for the Yard was found in the Material Laboratory and among shipfitters, welders and burners, electricians, pipefitters, shipwrights and painters. The principal causes of industrial illness in these shops can be seen by referring back to Table IV.

In a great majority of the cases seen at the Industrial Health Office the illness was not sufficiently severe to require sending the individual home or to a hospital. However each visit represents a certain amount of lost production time and of diminished efficiency. When welding fumes become annoying in a ship's compartment relatively few of the men are sufficiently affected to warrant a visit to the dispensary. The usual practice is to work for a time and then come up on deck for a "blow". In many cases according to some estimates, a workman may spend as much as one quarter to one half of his total work shift away from actual production because of the presence of excessive welding fumes. A similar statement may be made in regard to fumes from cutting and burning of metal, chemical fumes and irritant dusts. Skin irritants rarely result in significant loss of productive time but in many cases it is necessary to change the type of work of an individual who may have become sensitized to a particular skin irritant.

Methods and Equipment for Alleviating Exposure

A complete list of personal protective devices used in the various shops is given in Appendix B. The list includes goggles, respirators, helmets, gloves, face shields, hand shields, leggings and foot guards. The supply of these items appears to be adequate. The type of equipment ordered is decided upon by the shop personnel, the orders being approved by the Safety Engineer. The issuing of protective devices is done by the tool room storekeepers who are not always fully familiar with the type of exposure for which the equipment is issued and consequently one not infrequently finds employees using protective devices which are not properly suited to the work in hand.

A summary of sterilizing procedures for protective equipment is given in Appendix B. It is apparent that there is considerably lack of uniformity.

in the handling of sterilization. The repair and maintenance of protective devices also varies from shop to shop and in some instances has been found to be not entirely satisfactory.

There are two paint-spraying booths in the Yard, both of which function in a fairly satisfactory manner. Exhaust hoods over babbiting baths and lead pots are satisfactory. Indoor pickling tanks depend on general ventilation, which is apparently adequate. Radium dial painting is done in a well-constructed hooded table.

The principal ventilation problem concerns the removal of fumes created by welding and burning operations. In general, this is accomplished by portable blowers with flexible 4" metal hose. The figures given in Table III indicate that the methods in vogue are not always successful in accomplishing desired results. The problem is one of great complexity but is of sufficient importance to call for more attention than it now receives.

Recommendations

1. Employment of civilian "health inspectors" analogous to the present safety inspectors, to keep a close watch on all conditions which may adversely affect health and to assist in routine surveys.
2. Intensive study by ventilating engineers of methods of more adequately controlling welding fumes in ship construction and repair.
3. Improved maintenance and more enlightened issuing of personal protective devices. Certain shops are large enough to justify employing one or more individuals exclusively for this work.
4. Standardization of methods for sterilizing personal protective equipment.
5. Discontinuation of testing breath samples of x-ray workers for radon.
6. Approval by Industrial Health Officer of all protective hand creams, soaps and cleansers used by shops.
7. Approval by Industrial Health Officer of open purchase items such as solvents and cleaning compounds.

February 13, 1943

Table I
Distribution of Employees by Shop

| <u>No.</u> | <u>Shop</u> | <u>Name</u> | <u>Percent of total Employees</u> |
|------------|-------------|---|---------------------------------------|
| 00 | | Public Works | 0.1 |
| 01 | | Supply | 5.9 |
| 02 | | Transportation | 1.2 |
| 03 | | Power Plant | 0.4 |
| 04 | | Administration Labor | 0.7 |
| 06 | | Central Tool | 0.2 |
| 09 | | Material Lab. | 1.8 |
| 11-12 | | Shipfitters, riveters chippers, caulkers | 22.0 |
| 17 | | Sheetmetal | 3.6 |
| 23 | | Forge | 1.3 |
| 26 | | Welder, burner | 9.9 |
| 31 | | Machinist (inside) | 9.8 |
| 36 | | Machinist (ordnance) | 3.6 |
| 38 | | Machinist (outside) | 5.9 |
| 41 | | Boilermaker | 1.2 |
| 51 | | Electricians | 8.1 |
| 53 | | Coppersmiths | 1.3 |
| 56-58 | | Pipe, plumber pipecoverer | 5.1 |
| 61 | | Shipwright | 4.6 |
| 71 | | Painters | 1.5 |
| 72 | | Riggers | 6.0 |
| 76 | | Flag and Sail | 1.8 |
| 79 | | Public Works | 2.9 |
| 82-85 | | Foundry | 1.0 |
| 94 | | Pattern | 0.4 |

Table II
Periodic Examinations, 1942

| <u>Occupation</u> | <u>No. Examined</u> |
|--|---------------------|
| Crane operators | 178 |
| Enginemen | 53 |
| Plastic painters | 174 |
| Fibre glass workers (chest X-ray) | 257 |
| Asbestos workers (chest X-ray) | 146 |
| Foundrymen (chest X-ray) | 264 |
| X-ray, radium and radar workers | 24 |
| Clothing impregnation (tetrachlorethane) | <u>31</u> |
| Total | 1127 |

Table III
Principal Cause of Morbidity

| <u>Hazard</u> | <u>I</u> | <u>Non-I</u> | <u>Total</u> |
|----------------------------|----------|--------------|--------------|
| Fumes, welding | 135 | 152 | 287 |
| Fumes, cutting and burning | 23 | 14 | 37 |
| Fumes, chemical | 51* | 15 | 66 |
| Dust | 19* | 55 | 74 |
| Skin Irritants | 68 | 81 | 149 |
| Other | 23 | 168 | 191 |
| Total | 307 | 485 | 792 |

*In 10 cases there was a combined fume and dust hazard

I* cases considered to be of industrial origin

Non-I* cases considered to be non-industrial

Table IV
Occupational Disease Cases by Shop and Type of Hazard

| No. | Shop Name | Hazard | | | | | Total | |
|--------------|---------------------|---------|---------|----------|------|------|-------|----------|
| | | Fumes | | Chemical | Dust | Skin | | |
| | | Welding | Burning | | | | | Irritant |
| 01 | Supply | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 09 | Material Lab | 0 | 0 | 0 | 0 | 7 | 0 | 7 |
| 11 | Shipfitter | 31 | 4 | 4 | 1 | 1 | 5 | 46 |
| 12 | Grippler & Caulker | 20 | 2 | 1 | 1 | 4 | 3 | 31 |
| 17 | Sheetmetal | 5 | 0 | 1 | 0 | 2 | 0 | 8 |
| 26 | Welder | 39 | 16 | 1 | 0 | 0 | 6 | 62 |
| 31 | Machinist (Inside) | 0 | 0 | 0 | 0 | 9 | 1 | 10 |
| 36 | Machinist (ord.) | 0 | 0 | 3 | 0 | 3 | 0 | 6 |
| 38 | Machinist (outside) | 7 | 1 | 5 | 1 | 3 | 0 | 17 |
| 41 | Boiler. | 2 | 0 | 0 | 0 | 0 | 1 | 3 |
| 51 | Electric. | 14 | 0 | 4 | 0 | 13 | 4 | 35 |
| 53 | Copper. | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 56 | Pipe | 5 | 0 | 2 | 0 | 6 | 1 | 14 |
| 58 | Pipe cover. | 0 | 0 | 0 | 1 | 4 | 1 | 6 |
| 61 | Shipwright | 3 | 0 | 14* | 11* | 2 | 0 | 30* |
| 71 | Paint | 0 | 0 | 12 | 1 | 7 | 0 | 20 |
| 72 | Rigger | 5 | 0 | 3 | 2 | 2 | 1 | 13 |
| 76 | Flag and Sail | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 79 | Public Works | 1 | 0 | 0 | 0 | 3 | 0 | 4 |
| 82-85 | Foundry | 0 | 0 | 1 | 0 | 1 | 0 | 2 |
| Totals | | 133 | 23 | 51* | 19* | 68 | 23 | 307* |

* Ten cases had combined fume and dust hazard

Table Y
Occupational Disease Morbidity Rates by Shop.

| <u>Shop</u> | | | | |
|-------------|--------------------|---------------------|----------------------|---------------------|
| <u>No.</u> | <u>Name</u> | <u>Man Hours(1)</u> | <u>O.D. Cases(2)</u> | <u>O.D. Rate(3)</u> |
| 01 | Supply | 7.53 | 1 | 0.13 |
| 09 | Mat. Lab. | 1.19 | 7 | 5.89 |
| 11-12 | Shipfitter | 21.33 | 77 | 3.62 |
| 17 | Sheetmetal | 3.28 | 8 | 2.44 |
| 26 | Welders | 11.55 | 62 | 5.37 |
| 31 | Machinist (Ind) | 9.38 | 10 | 1.06 |
| 35 | Machinist (Ord.) | 3.06 | 6 | 1.96 |
| 39 | Machinist (Out) | 5.30 | 17 | 3.21 |
| 41 | Boiler | 1.44 | 3 | 2.08 |
| 51 | Electric | 7.95 | 35 | 4.40 |
| 53 | Copper. | 1.25 | 1 | 0.81 |
| 56-58 | Pipe & Pipecoverer | 4.63 | 20 | 4.32 |
| 61 | Shipwright | 4.65 | 20 | 4.30 |
| 71 | Paint | 1.64 | 20 | 12.20 |
| 72 | Rigger | 6.14 | 13 | 2.12 |
| 76 | Sail and Flag | 1.89 | 1 | 0.53 |
| 79 | Public Works | 3.14 | 4 | 1.27 |
| 82-85 | Foundry | <u>1.04</u> | <u>2</u> | <u>1.92</u> |
| Total Yard | | 111.00 | 307 | 2.76 |

(1) Millions of man hours for period Sept. 1, 1941 to Dec. 31, 1942

(2) Total cases for period Sept. 1, 1941 to Dec. 31, 1942

(3) Number of cases per million man hours.