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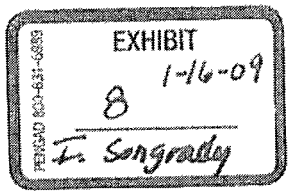
PACIFIC COAST SHIPYARD SAFETY CONFERENCE

Sponsored by

SEATTLE SAFETY COUNCIL

AMERICAN SOCIETY OF SAFETY ENGINEERS
Puget Sound Chapter

PUGET SOUND SHIPBUILDERS ASSOCIATION



DECEMBER 13 and 14, 1945

New Washington Hotel Seattle, Washington

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"A WORD OF WELCOME"
Outline of Opening Address
of

CAPTAIN H. K. WALLIN
Supervisor of Shipbuilding, U. S. Navy
Seattle and Tacoma Area

This safety conference convenes as the nation approaches the end of a tremendous wartime shipbuilding and repair program, and at a time when much thought is being given toward a healthy peacetime development of the shipbuilding and repair industry, particularly on the Pacific Coast. Certainly organized accident prevention is an essential feature both in the industrial relations and economics of the industry.

Organized accident prevention in all industry during wartime accomplished much under the patriotic urge to "save manpower for warpower"; thus, fewer workers were killed in occupational accidents in 1944 than in 1941, despite largely increased aggregate employment and the handicaps incidental to war production. Nevertheless, in 1944 occupational accidents in all industry took 17,500 lives, caused 1,800,000 non-fatal injuries, and cost an estimated $2,300,000,000.

The Navy safety record in government-owned yards is good, with a 1944 accident frequency per million manhours worked of 12.2, and a further 19% reduction in the first 7 months of 1945. The National Safety Council has recently recognized this record with presentation to the Navy of its "Award of Honor for Distinguished Service to Safety". The Navy is definitely safety conscious and is going to stay safety conscious; its record is good, but it can be better; and the Navy Department is committed to a postwar safety program that will bring the Navy to the top of the safety heap.

The contract shipyard safety program sponsored by the Navy Department and Maritime Commission has led to substantial reductions in the volume of work injuries. Thus, in 1943 the entire group of yards under government contracts reported an accident frequency of 31.2. In 1944 the figure for all reporting yards was down 23% to a frequency of 23.2, with a further 5% reduction in the first 7 months of 1945. The all-important manpower savings involved can be illustrated with an estimate that the 1944 reduction involved the prevention of about 19,000 disabling injuries, directly saving at least 380,000 man-days for urgent ship production in 1944. Beyond this, it is estimated that 550,000 non-disabling injuries were prevented, in turn saving a further saving of 82,500 man-days of production, based on a Department of Labor study showing that on an average each such non-disabling injury results in the loss of 1.2 hours of working time.

The foregoing statistics indicate a wartime shipyard safety job well done. However, let's not lose sight of the 71,500 injuries which did occur in the contract yards in 1944, both from a humanitarian standpoint and in connection with the millions of dollars of direct and indirect costs the industry sustained thereby. During wartime those expenses were largely borne by the Government, but from now on they are an important and competitive overhead cost of doing business, ultimately paid for by the customer, and important particularly to the shipbuilding and repair industry on the Pacific Coast. These costs are substantial - I'll illustrate with some figures from one of the principal yards in the Puget Sound Area. (Todd-Pacific, Tacoma). In a recent month 2300 industrial injury visits to the yard first-aid station or 345 man-days lost to production but paid for and

charged to the job. The same yard, in that month, paid over $20,000 for workmen's compensation protection. Add to these direct costs, safety men, nurses, doctors and all the indirect costs arising out of the accidents which did occur, and who can doubt that management should have a real economic interest in accident prevention?

An effective safety program must have the wholehearted support of top management. The management must recognize that accidents are expensive (total costs estimated at 3-4 times direct costs) and, with rare exception, unnecessary and preventable; that accident prevention aids production efficiency and economy; that a good safety program promotes good employee and public relations; that safety is a non-controversial subject on which management and workers can work together to mutual advantage. This management policy must be made clear to all executives and employees, and top management must show continuous interest and take active part in the safety program. In order to really make progress in accident prevention it is necessary to indoctrinate all department heads so that they will be in sympathy with safety work. Employee acceptance and cooperation also are essential. It is therefore advisable that employees be given an opportunity to assist in preparing the program, to offer suggestions, and to participate and cooperate to the fullest extent.

Long before the war, many executives were convinced of the economic value of organized accident prevention work, and they carried that conviction into their wartime operation. To others, particularly those who have reached positions of authority during the war years, safety has seemed just another "war baby", born of the acute manpower shortage and accepted at the urging and with the financial support of government. This incorrect impression has undoubtedly been aggravated by the inexpert direction and high cost of safety activities in some war plants, due to the dearth of experienced safety directors.

Thus the safety movement itself needs "reconversion" to its normal peacetime character - identification with efficiency and with good industrial and public relations, whether business is good or bad, manpower scarce or abundant.

The fundamentals of accident prevention apply equally well to plants of all sizes. It is well within the province of a small plant to carry on an excellent program of accident prevention in keeping with its size and the nature of its operations and without the aid of a safety director or an elaborate safety organization. However, relatively few small plants have effective safety programs; the remainder need continued stimulation and assistance by outside agencies.

A final point - it appears that there is a definite trend toward standardization of state safety codes, coupled with a greater legal responsibility on management for the organization, maintenance and enforcement of satisfactory safety educational standards. These, coupled with increased workmen's compensation benefits and costs, make it imperative that management take a much greater and more direct interest in organized safety and accident prevention for both humane and financial reasons. Also, of importance, safety is a common meeting ground for both labor and management, and an effective program can be the cornerstone of an employer's industrial relations program.

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"GENERAL SHIPYARD SAFETY"

A panel discussion by personnel from the Puget Sound Naval Shipyard.

PART I.

RUSSEL J. HIBBARD, Master Mechanic
Sheet Metal Shop, Puget Sound Naval Shipyard, Bremerton, Washington

Mr. Chairman and Gentlemen:

Upon receipt of your kind invitation to address this conference I doubted the value of anything I could offer on the subject of safety that you do not already know. Safety engineering is your profession. It covers a wide and specialized field of knowledge and you have studied the subject more thoroughly than I could ever hope to do since I am a Master Mechanic and not a safety engineer.

It occurred to me, however, that a relationship exists between the Master Mechanic and the Safety Engineer, the foreman and the safety inspectors, that can be analyzed to our mutual advantage. A better understanding of this relationship will advance the cause of safety and is therefore appropriate at this time. It is the purpose of this panel to present the point of view of the foreman and his conception of the proper division of authority for a safety program and its relationship to production in a typical shop. During the free discussion period following it is expected that you will correct any misimpressions we may have on this subject, leading to a better understanding as a result.

My associates who will speak in turn on this panel are on my right; Mr. Wesseler, Master Electrician and Mr. Taylor, Foreman Sheet Metal Worker. These men have been chosen as representative of their field and because their departments have a very excellent safety record.

As a foundation for further discussion I will make the following remarks. First, I wish to point out that a safety program cannot be carried on successfully independent of the production schedule. Every act that involves production, planning or the leadership of workmen on a job also involves safety. The production process is inseparable from the action required for safety.

If the actions for safety and the action required for production on a job are inseparable, the person who controls production also controls safety. It follows then, the person responsible for safe action is the line supervisor of production. As we have often found out by bitter experience, regardless of our ardent plans for safety, the foreman is in a position to make or break the safety engineer's program.

If the safety engineer is to be worth his salt he will recognize this and not take an officious attitude toward the foreman. Because of the foreman's strategic position in safety any argument between the safety engineer and foreman can only have one result so far as safety is concerned and that is a very poor one. To advance safety it is inevitable that the only recourse of the safety engineer is to cultivate the cooperation of the line supervision.

The safety engineer who relies entirely on his knowledge of the techniques of safety to advance his cause will not fare well, however expert he may be. His knowledge of how to get the cooperation of key men in his activity is far more important than his knowledge of safety and when

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that is done, and only then, is the way open for the use of technical knowledge of safety. How then, can we get the cooperation of foremen?

I would suggest that we approach the problem directly. We can say what we will but cooperation always entails doing something for someone else. We must do something for the foreman. In talking safety we can learn to use the language that appeals to his point of view. We can talk about production and what safety will do to improve it. Remember this has a special appeal because by improving production the foreman gets his promotions and increases in salary. Try to think and analyse safety in terms of dollars saved, better morale and more coordinate effort between the foreman's employees. Safe practice happily adapts itself to this approach very excellently. This approach will induce cooperation.

Another point I may add to this is that if you have decided that you must get the foreman's cooperation, do not go about it with reluctance, do it wholeheartedly, be direct, honest and free in your consideration of the foreman's position. By the use of accurate statistics keep him informed as to accident trends in advance, in his department. Help him avoid the embarrassment of a poor showing or a serious accident by showing him who his accident prone employees are, etc. He will appreciate this help if it is given to him in the spirit of helpfulness and does not carry with it a tinge of show-off or criticism. Once the enthusiastic cooperation and support of the foreman is gained in any safety program the safety engineer will be called upon much more often for his services and advice. No safety engineer need worry about his prestige and livelihood if the accident rate of the plant is low and he gains the cooperation of his associates, the foremen. He will stand out as a man who understands and can deal with the human forces that he must get into action to succeed in his chosen field. To obtain the foreman's cooperation is an essential part of the profession of a safety engineer.

In your attitude toward the foreman it is suggested that since he is directly responsible on the job for putting into effect the safety program, he should get the blame or credit for its failure or success, as the case may be. I have often heard safety engineers blame the foreman for a poor safety record and hear these same safety engineers boast and view with pride what they themselves did when the record was good. This is a poor way to get cooperation. Remember the foreman is always under fire on costs and completion schedules. His work is never static but is always dynamic. Allowance must be made for his obstinancy in some respects. If he were a person easily influenced, who could not stand his ground, he would be a very poor foreman. He must have stability of character. If he is responsible for everything that happens in the shop give him unstinted credit when the work is good, especially if it results in a good safety record. This will gain his confidence and cooperation.

"GENERAL SHIPYARD SAFETY" - PART II.

ALBERT L. TAYLOR, Foreman Sheet Metal Worker,
Puget Sound Naval Ship Yard, Bremerton, Washington

Mr. Chairman and Gentlemen:

It was about two weeks ago that I first learned from our Safety Officer, Lt. Scott Hazen that this Safety Conference was to take place in Seattle and I had hopes of finding an opportunity to attend this meeting because of my intense interest in safety work. At that time I had no idea of taking an actual part in the program. Since then I have been requested by your organization, through Russel J. Hibbard, Master Sheet Metal Worker, to give you my views of "Why the Foreman Should be Interested in Safety."

My position in the Puget Sound Naval Ship Yard at Bremerton is that of Foreman in charge of Shop Production in a large Sheet Metal Shop and production is primarily what I am interested in. Many people have asked me why I am so interested in safety and wonder how I devote so much of my time to safety work aside from my regular duties. During the past three years safety has become a sort of a hobby with me, and I have been able to apply it successfully on the job as Shop Foreman. It does not take a great deal of one's time because of a closely knit organization and the splendid cooperation and assistance of the supervisors and workmen who carry on the safety program and who have contributed a great deal to its success. My job is to lead the way or steer the course.

As Mr. Hibbard has mentioned in his talk, the safety program has paid great dividends measured in increased and more efficient production at a time during the war when it was needed most. It has, from a humanitarian standpoint, reduced the number of painful injuries to an absolute minimum, and yes, no doubt saved lives or prevented permanent disability. The safety record of the shop has been an important factor in speeding up production and in keeping morale at a high level.

The final responsibility of safety in the prevention of accidents does not rest with you men, but it does lie with the supervisor on the job. He is the key man in industry and he alone is the one we must look to for the success or failure of a safety program. It is considered a fact that to become a supervisor, a man must be a workman of no mean skill or ability. He has better than a working knowledge of the rules and his attitude corresponds to the extent that he is ready, willing and able to carry out orders and responsibilities. Orders, when pertaining to the safety program, have a manifold purpose: production, efficiency, and humanitarianism. If a supervisor is not well acquainted with or does not take this purpose to heart, he is not fitted for the job he holds; that of teaching and leading others. The responsibility for accidents rests with him. The foreman who realizes all this knows that there cannot be excuses or alibis for injuries.

The principles of safety in industry are closely related with the classroom training program for supervisors in job organization and personnel relations. During the peace time years 1937 to 1940 inclusive, there was not a single lost time accident in the Sheet Metal Shop. In 1941 and 1942 the influx of new workers, skilled and unskilled men and women unfamiliar with this type of work, soon made it evident that an organized safety program was necessary for effective production. It became necessary thoroughly to indoctrinate many of the newer supervisors in safety. To those familiar with safety work it is generally understood that to be effective, safety begins with top management or the executive head of the department and in this case the Master Sheet Metal Worker, Mr. Hibbard. After a

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consultation with him I was given permission to outline an organized safety program and it received his wholehearted support. This plan is not new, there are many similar plans throughout industry with which you men are familiar, but the one thing that was uppermost in our minds was to create the necessary enthusiasm and interest of the supervisor and the workmen alike to want to make this program a success; we must create new ideas and suggestions and keep the safety meetings alive with interest. The answer was to give the supervisor and the worker an active part in it.

SHOP SAFETY ORGANIZATION:

The Sheet Metal Shop "Safety Chairman" is appointed by the Master, and is the Foreman in charge of Shop Production. The responsibility for the success of the shop safety program rests with the Production Foreman. However it is organized so that much of the detail and work automatically becomes the duty of special staff as assistants. A Shop Safety Inspector is employed on a part time basis. A secretary, and safety inspection committees, made up of employees from all supervision and worker levels, function as safety staff assistants. They are responsible to the chairman and Production Foreman in carrying out their duties.

SAFETY MEETINGS:

Joint safety meetings with the inside and outside supervisors are held every two weeks and are of one hour and fifteen minutes duration. Meetings are usually conducted by the safety chairman, but in order to instill a variety and promote interest, the supervisors alternate in presenting safety topics at the meetings. All of the supervisors are not able to attend the meetings at one time so the groups are equally divided, each supervisor attending the safety meeting once a month.

PURPOSE OF THE MEETINGS:

Meetings are held to discuss safety problems and to make possible recommendations for new plans and ideas, also to appoint safety committees and hear their reports; to build up a friendly spirit of cooperation among supervisors and workers and to develop a friendly spirit of competition between departments.

Charts on the blackboard graphically illustrate the accident trend and are explained to show the supervisor the true relation of safety to his own workers and the production of the shop. Instructional movies shown in the meetings widen his train of thought to include safety programs of other plants.

SAFETY INSPECTION COMMITTEES:

The safety committees are usually made up of six men and women workers, and headed by one supervisor and the Shop Safety Inspector. Such committees are given specific assignments to inspect various departments of the shop as well as certain portions of the ships which are being repaired in the yard.

Each one of the committee is given a check-off sheet showing him what to look for on his particular assignment such as housekeeping, safeguards, material handling, etc. Typewritten reports on unsafe practice or conditions are made through the safety chairman. They also contain recommendations designed to eliminate hazards.

Members of such committees and other employees have presented many important suggestions. As a result some have Beneficial Suggestion Plan Awards and have benefited financially from their suggestions.

SHOP SAFETY INSPECTOR:

The Shop Safety Inspector is employed on a part time basis in the Sheet Metal Shop. His duties include safety work and the indoctrination of new employees. He has had considerable experience in safety work and was selected because of his background. The Shop Safety Inspector is directly responsible to the Shop Production Foreman in all of his activities. He makes reports to the safety chairman, and suggests action which he believes should be taken in matters pertaining to safety.

His authority is limited to the extent that he does not give orders to supervisors or workers, but in his association with them, he cooperates by making many helpful suggestions. The Shop Safety Inspector makes a systematic follow-up on all recommendations of the Safety Inspection Committees which have been adopted by the foreman and constantly checks to see that the suggestions are satisfactorily used. In general, the Shop Safety Inspector's duties call for him to: (1). Take an active part in all safety committee inspections; (2). Prepare charts on the blackboard regarding safety meetings; (3). Keep safety records; (4). Inspect shop daily for safety and fire hazards; (5). Cooperate with all supervisors to eliminate unsafe practices, investigate all accidents, etc.

SAFETY EDUCATION:

All new employees spend their first day in an indoctrination school. They receive information concerning the shipyard and the rules, regulations, and policies which apply to workers. They get job instructions and learn of safety regulations.

New employees are assigned to the shop, where they receive further indoctrination on shop policy, personnel problems and safety. Job instruction is explained by an instructor who functions under the supervision of the shop personnel supervisor. Employees see a movie or slide film on safety, and are then conducted on a tour through the shop. Small groups of five or six persons accompany the shop safety inspector on such trips. The complete indoctrination requires approximately four hours.

At the time the supervisor takes the new employee through his particular activity and shows him the work which is being done, he explains the safety program and points out all unsafe practices and the precautions which are taken to prevent injuries.

On a regular schedule, once each week movies are shown to employees and safety subjects are often featured.

A sign in each department shows the number of lost time accidents which have occurred since the first of each year. The tabulation creates an inter-departmental spirit of competition which aids in reducing the number of accidents.

RESULTS OF THE SAFETY PROGRAM:

To illustrate the effectiveness of the safety program which has been used in the Puget Sound Naval Ship Yard - Sheet Metal Shop, the following comparison is made:

Six months period, before program was initiated cumulative lost time days July 1, 1943 - through December 31, 1943 - 40 lost time days.

The accident frequency record in the Puget Sound Naval Ship Yard - Sheet Metal Shop at the present date is - 2.60 and the severity rate is - .15. This is the lowest Sheet Metal Shop accident rate in any of the U. S. Naval Ship Yards.

The safety program has created a great deal of enthusiasm and interest among the supervisors and has been of benefit to many employees. The supervisor has learned that his first responsibility is safety and that is so arranged to fit in with his job analysis for production. He has learned that he must know these rules and set an example by living up to the rules and regulations himself. He has learned that the success of the safety program depends on him - that the supervisor is like the keystone in a stone arch and is the determining factor in the success or failure of an industrial safety program. So great is his success or failure that, should he fail, the entire program would crumble as surely as the stone arch would crumble were the keystone of poor quality or imperfect construction.

Without the willing cooperation and support of the supervisor and the employee this safety program of the Sheet Metal Shop would not have been a success and much of the credit rightfully belongs to them. They can take pride in this record of a 2.60 frequency, the lowest of any of the Naval Ship Yard Sheet Metal Shops.

I wish to thank you for the opportunity of taking part in the Safety Conference and hope this is only the beginning of many successful conferences in the future.

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Panel Discussion

INTRODUCTION - G. E. Jordan: The session this afternoon on occupational diseases, I believe is one of the most neglected of all hazards not only in shipyards, but in all other types of industry. Of course we have all run into them, have considered them and have done what we could to correct the hazards, but one thing I think we have overlooked, is adequate tests for the hazards and experimentation in various gases, fumes, dusts, etc. They are present in all industries and I think a pretty good job has been done in controlling those that are known, though we have overlooked their aftermath.

I think a lot more than actual physical injury, we are going to have backfire on occupational diseases. In the next ten years I think there is going to be more insurance paid out as a result of occupational diseases than for physical injuries. We know what injury is. If a man is paralyzed as a result of a fractured spine, we know that is going to be a pension case, but we don't know what the results of some of these fumes will be. Clinically the doctors have a pretty good idea, but from the claims coming in, we find the workmen are blaming much on conditions in industry. I believe Dr. Farner, as a result of his experimentations and tests, can give you a good idea of what is happening in industry.

I will call on Drs. L. M. Farner and Frederick Klyfield to take over now.

PART I.

LLOYD M. FARNER, M.D.
Head, Industrial and Adult Hygiene Section,
Washington State Department of Health

Members of the conference and guests:

Perhaps I should go into the formal requirement of Officers of the U. S. Public Health Service: We are always asked to explain briefly who we are. I am on loan from the U. S. Public Health Service to the State of Washington, serving as Head of the Industrial and Adult Hygiene Section of the Washington State Department of Health. I am speaking to you, however, not as a federal employee, but as a member of the State Department of Health. Incidentally I am on terminal leave and I am really officially with the State Department.

According to our records there were approximately 111,000 workers in the shipyards in the State of Washington during the major portion of the War Shipbuilding Program.

The services of the Industrial and Adult Hygiene Section of the State of Washington Department of Health consisted chiefly of:

1. Medical, engineering and nursing services designed to assist management in the prevention of occupational diseases, and

2. The promotion of more adequate health services in the industry in order that they might better cope with both occupational and non-occupational disease problems or, in other words, that they might conduct a program of preventive medical services.

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Throughout the war this department cooperated very closely with the U. S. Navy and Maritime Commission in their industrial hygiene programs. We exchanged information freely with them and our services were so designed as to supplement their work in the shipyards.

We also cooperated very closely with the State of Washington Department of Labor and Industries, and to all intents and purposes took care of the occupational disease work for them since their department had inadequate provision for dealing with the problem of occupational disease control. Thus our program eliminated the necessity of their establishing a program of industrial hygiene.

Throughout the war we were extremely limited in both personnel and facilities and thus it was impossible for us to do very much in the way of research. Our greatest contribution, I believe, was in assisting the industry with applying the knowledge relative to preventive health services that had been gained elsewhere.

The occupational diseases in the shipbuilding industry are many and varied. There are numerous occupational disease hazards including exposure to such toxic materials as: toxic dusts, gases, vapors, mists and harmful rays.

As a part of the cooperation between the Department of Health and the Department of Labor and Industries, the latter provided us with copies of all reports of occupational disease claims. These were analyzed in order that steps might be taken to attack those diseases most commonly reported. From October 1942, at which time this Section was created and we began receiving these reports, until January 1, 1944, there was an average of 75 occupational disease reports per month from the shipyards alone. During the first six months of 1944 there were 32 reports per month. During the last six months of 1944 there were 21 per month. During the first six months of 1945 there were 21 per month.

The principal conditions reported as occupational diseases acquired in the shipyards were:

	Reduced from:
Dermatoses	14 per month, 1943, to 7/mo., 1945
Conjunctivitis	33 " " " to less than 1/mo., 1945
Inflammatory processes	7 " " " to 7/mo., 1945
Respiratory conditions	9 " " " " 4/mo., 1945
Systemic poisoning (includes acute metal fume fever)	5 " " " " 2/mo., 1945
Miscellaneous	7 " " " " 2/mo., 1945

Because of the tremendous amount of acute metal fume fever and the fact that the welding fumes were believed responsible for so many different illnesses we also made a breakdown of the number of acute cases of metal fume fever and a total of all illnesses due to welding fumes. Acute metal fume fever was reduced from five per month in 1943 to less than one per month in 1945, while the total of all illnesses due to welding fumes was reduced from 17 per month in 1943 to two per month in 1945.

OCCUPATIONAL DISEASE CLAIMS FILED BY SHIPYARD WORKERS

Period	Est. Population	Total OD's	Dermatosis	Conj. Infl.	Resp.	Systemic Poisoning *	Other	Acute Metal Fume Fever	Total of all illness due to welding fume
10/1/42 - 12/31/43	111,200	1123 (75)	203 (14)	489 (33)	104 (7)	135 (9)	90 (6)	102 (7)	82 (5)	250 (17)
1/1/44 - 6/30/44	111,200	192 (32)	63 (11)	23 (4)	43 (7)	20 (3)	25 (4)	18 (3)	22 (4)	30 (5)
7/1/44 - 12/31/44	111,200	124 (21)	38 (6)	2 (**1)	33 (6)	23 (4)	13 (2)	15 (3)	0 (0)	8 (1)
1/1/45 - 6/30/45	111,200	125 (21)	39 (7)	3 (**1)	47 (7)	22 (4)	9 (2)	10 (2)	1 (**1)	13 (2)

* Includes acute retal fume fever.
** Less than one.

Figures in parenthesis give average monthly number of claims for each classification.

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Now let us consider the principal operations in shipbuilding which create potential health hazards. Most important among these operations are: welding, burning, brazing, shrinking, painting, radium and x-ray photography, sandblasting, scaling, tinning, galvanizing and sherardizing, electroplating, cleaning, bright dipping etc., insulating, cable (electric) pulling and installation.

Welding, burning and brazing, broadly speaking, include electric and acetylene welding, burning, brazing, cutting and shrinking. There are exposures to numerous oxides of metals which are volatilized by these operations. For example, these operations, when performed on galvanized metal, produce zinc oxide fumes which are particularly prevalent in destroyer construction. This operation presented a very real problem in the early stages of the shipbuilding program but the effects of inhalation of zinc oxides are clear cut. I hope Dr. Slyfield will discuss the medical consideration of exposure to zinc oxide.

Welding on surfaces painted with lead based paints gives off lead fumes - this will constitute a very real problem in ship repair since many old ships are painted with layers of lead based paint. One reconstruction job we studied recently had five distinct layers of lead based paint through which it was necessary to burn in order to cut or weld. This, of course, led to high concentrations of lead fumes.

Other metals we have encountered in these operations are iron oxide, arsenic, and cadmium, while the gases fluorine, oxides of nitrogen, ozone and carbon monoxide are also encountered.

Total fume was commonly determined by the U. S. Navy and Maritime Commission in their work, the recommended allowable limit having been set at 300 mgs. per 10 cubic meters. We had very little total fume determinations since it was our feeling that this gave only a general index of the total fume but did not show how much of the individual constituents might be present, thus we felt it advisable to determine each important potentially hazardous material independently.

The oxides of nitrogen presented a sufficiently important problem to warrant our doing some independent research. This was particularly true in shrinking operations. The death of one worker and the illness of two others who had been shrinking in a small compartment resulted in an engineering study which revealed extremely high concentrations of oxides of nitrogen. Subsequent control studies indicated that there might be several influencing factors in producing high concentrations of oxides of nitrogen such as the presence of water or cold metal in contact with flame. These did not, however, produce any noticeable effect on production of oxides of nitrogen.

The conclusions reached from this study are: 1. Oxides of nitrogen can reach high concentrations in a very short time (4 to 7 minutes). 2. Presence of water or cold metal surfaces have no noticeable bearing on the production of oxides of nitrogen. 3. Concentrations were found to vary directly with the rate of acetylene consumption. (See charts)

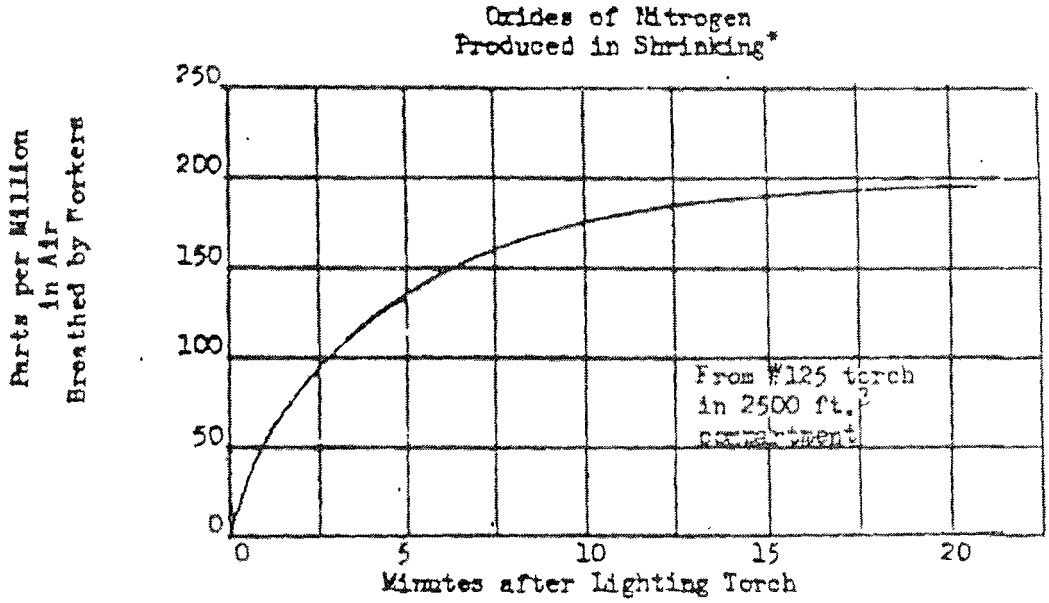
In insulating, exposures to many different types of dust were studied, including such exposures as: sandblasting, scaling, grinding, asbestos, fiberglass, etc. Limited time this afternoon will permit a discussion on only one and perhaps brief mention of another of these dusts.

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SHRINKING OPERATIONS ARE HAZARDOUS
From
OXIDES OF NITROGEN

Acute Physiological Response to NO_2 in Air

Maximum Allowable Limits	Slight Symptoms After Several Hours.	Max. for 1 Hour Without Serious Disturbance	Dangerous to Life in ½ to 1 Hour	Kills Most Animals in Short Time
Parts Per Million by Volume in Air				
25	30-40	50-100	100-150	240-700



Effect of Torch Size on Production of Oxides of Nitrogen*

Size of Tip	Acetylene Consumption (Cubic Feet per Hour)	Average Concentration (Parts per Million of NO_2)
4	15.9	38
6	31.6	80
8	60.0	210
10	88.5	280
12	175	352
Produced in 4-7 minutes in compartment of approx. 700 ft.³ volume		

* Results of tests by State of Washington Department of Health

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Let us consider first the problem of exposure to asbestos. The dustiest operations experienced were those involving amosite - a long-fibered form of asbestos. This material is very dusty when handled dry, and comes in bulk, blanket, or rigid form. Operations in its use include hand cutting, cutting with band saw, sewing into mats, etc. Concentrations found were well over recommended allowable limit.

The exposures found seemed to be substantiated by apparent cases of asbestosis reported in occupational disease claims. Dr. Slyfield will probably have something to say about this problem in connection with the medical aspects of asbestos exposures. The dustiest operations from asbestos were not on board ships but in prefabricating shacks.

Since there has been so much discussion about fiberglass I feel that I must at least mention it although time will not permit any detailed discussion. Fiberglass particles, as reported in the literature, are too large to enter the small tissues of the lungs and thus we have not seen fit, because of limited time and facilities, to make extensive studies in connection with fiberglass. Although we believe that fiberglass dust is not a serious potential hazard to the lungs we do hope to investigate this problem further and regret that we have been unable to do so heretofore. I might say that we have had no reason to believe that anyone has been injured from the inhalation of the fiberglass dust.

The use of radium and x-ray in industry presents a very delicate and serious potential health problem. Radium salts are used at any stage of ship construction and at most any time or location within a yard. Due to the apparent insignificance of a small vial of radium salts, operators and other workers become careless in handling it. Serious exposures to radium and x-ray were found in our studies where they were least expected. Radium salts stored temporarily in shacks adjacent to ways offered unsuspected exposures to office workers. We also found that portable carrying cases do not always insure safe conditions in their immediate vicinity.

In conclusion I should like to point out that as a result of our combined efforts in determining the causes of occupational diseases and the effective use of ventilation and other control measures we have accomplished results which have been definitely reflected in the reduction of the number of occupational disease claims submitted by shipyard workers. In comparing the average monthly number of occupational disease claims filed by shipyard workers in 1943 with those for the first six months of 1945 a reduction in total occupational disease claims of over 7[illegible]% was realized!

Practically all classifications of occupational diseases showed a reduction as I pointed out in my introductory remarks. The two largest contributors, namely, conjunctivitis and illnesses resulting from welding fume exposures were reduced almost entirely in the first case, and over 90% in claims filed believed to have resulted from welding fumes.

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TYPICAL POTENTIAL HEALTH HAZARDS

IN SHIPYARD OPERATIONS

Operation	Potential Hazards	Recommended Allowable Limit	Maximum Found* in Shipyards	Method of Sampling
Welding, Burning and Brazing	Oxides of Nitrogen	25 ppm	29 ppm	Vacuum Flasks
	Zinc Oxide	150 mg/10 m^3	416 mg/10 m^3	Precipitator
	Lead	1.5 "	15.1 "	"
	Iron Oxide	300 "	265 "	"
	Arsenic (Trioxide)	1.5 "	0.13 "	"
	Cadmium	1.0 "	11.1 "	"
	Total Fume	900 "	---	"
	Fluorine	3 ppm	2.2 ppm	Precipitator, Absorber
	Ozone	1 "	---	Absorber
	Carbon Monoxide	100	---	CO indicator
Shrinking	Oxides of Nitrogen	25 ppm	480 ppm	Vacuum Flasks, Absorber
Painting	Aromatic Solvents	100 ppm	315 ppm	Benzene Indicator
	Lead	1.5 mg/10 m^3	---	Precipitator, absorber
	Zinc Chromate	1.0 "	---	"
Radium & X-Ray Photography	X (gamma)-rays.	0.1 roentgens	in excess of 0.1 roentgens	Minometer
Sandblasting, Scaling, etc.	Silica	5 mppcf	---	Impinger, Konimeter
	Total Dust	50 "	640 mppcf	"
	Lead	1.5 mg/10 m^3	---	Precipitator
Tinning.	Lead	1.5 mg/10 m^3	0.2 mg/10 m^3	Precipitator, Impinger
	Acrolein	1 ppm	---	Absorber
Galvanizing, Sherardizing	Zinc (oxide)	150 mg/10 m^3	---	Precipitator, Impinger
Electroplating, Cleaning, Bright Dipping etc.	Hydrochloric Acid	10 ppm	6.5 ppm	Absorber
	Nitric Acid (Oxides of Nitrogen)	25 "	29 "	"
	Sulfuric Acid	10 "	2 "	"
	Cyanide	20 "	---	"
	Ammonia	100 "	---	"
	Formaldehyde	10 "	---	Absorber, Vacuum Flasks
	Chromic Acid	1 mg/10 m^3	---	Absorber
Insulating	Asbestos	5 mppcf	45 mppcf	Impinger
Cable (Electrical) Pulling & Installation	Chlorinated Naphthalene & Diphenyls	---		Absorber
Many of these Materials also are Capable of Causing Dermatitis				

*From tests conducted by the State of Washington Department of Health.

mg/10 m^3 - Milligrams per 10 cubic meters (approx. amount of air breathed per working day).

ppm - parts per million by volume in air.

mppcf - Million particles per cubic foot of air.

G. K. Jordan: Now, without any further ado, we will call on Dr. Frederick Slyfield, who is recognized as one of the leading heart and lung specialists in the State of Washington and who has had more experience in diagnosing and treating occupational diseases of the lungs than anyone I know of in this area.

FREDERICK SLYFIELD, M.D.

Gentlemen:

In looking over this excellent program I feel extremely gratified that such a thing has been put on here. I suppose it has been done here, there and elsewhere, but it is the first time I have seen anything like it.

Dr. Farner has laid out something for you that anybody can see and understand. Mr. Jordan asked me to say a few words about the effects of certain industrial hazards from the doctor's point of view:

1. Welding Fumes
2. Nitrogen Dioxide
3. Asbestos
4. Fibrous Glass

Several factors are present in the arc welding process which may be considered. There is the smoke, commonly called "fumes", containing finely divided particles of iron oxide and in the case of galvanized steel, zinc oxide is added to the fumes. Also there is nitrogen dioxide which sometimes causes trouble.

Judging by the complaints presented by men coming to our office, it would seem that the most common illness arising among welders is Metal Fume Fever. Every welder apparently knows something about this condition and the illness has frequently been referred to as "galvanize poisoning". This is an acute illness of brief duration, from a few hours to three days, which usually comes on several hours after excessive exposure. The chief symptoms are first a sweetish taste and sense of weariness, soon followed by chills and fever and sometimes by pain in the chest. These have been the characteristic symptoms from time immemorial. The disease was recognized a hundred years ago and more, but many welders have added other symptoms such as backache, headache, constipation, diarrhoea, chronic fatigue, lung hemorrhage, insomnia, heart disease, various skin conditions and even sexual impotency to the list. These latter do not represent galvanize poisoning. However, there is a marked tendency on the part of the worker to present his symptoms, whatever they may be, and then provide his own diagnosis which is invariably "galvanize poisoning".

Metal Fume Fever is the generally accepted term for this disease and it may be produced by inhaling the fumes resulting from the melting of zinc, brass, nickel, aluminum, copper, silver and mercury, and perhaps some other metals found in the welding rods. As a rule the patient is quite ill for a day or two and then resumes our work, feeling as well as ever. It is a common opinion among welders that the condition may be prevented by drinking milk and there appears to be some basis for the practice.

The fumes arising from the welder's arc contain both gases and finely divided particles of metal. Experimental work has shown that both the nitrogen dioxide and the zinc oxide fumes can cause trouble and in some instances even the iron oxide dust. Nitrogen dioxide is a lung irritant. There is less nitrogen dioxide given off in welding with the coated rods than with the uncoated. A few cases of pneumonia have been reported in

which it appears that nitrogen dioxide inhalation has been the cause. However, a study of 864 cases of pneumonia in the Kaiser Shipyards at Richmond, California last year showed pneumonia was no more common among welders than among other craft. Nitrogen dioxide is recognized as a respiratory irritant however, and should be avoided.

The inhalation of iron dust (iron oxide) in considerable concentration has been known to produce sufficient deposit in the lungs to present a nodulated appearance in the x-ray film. I recall one such case in a man whose work consisted in grinding stove tops with an emery wheel. There was no illness and the deposits of iron gradually disappeared. Deposition of iron in the lung apparently does not occur unless the work is done in very close quarters and the iron dust concentration is high. Even though the iron dust deposit is visible in the x-ray, it seems to produce practically no symptoms.

In a case recently examined at our office, the workman had inhaled a considerable quantity of iron particles in a grinding process. So much iron dust was created in the form of hot sparks from the grinding wheel that the workman's glasses were mottled with the tiny particles sticking to the lenses. The glasses felt like sand paper and could no longer be used. The patient's complaint had nothing to do with this undesirable atmosphere however, and the x-ray film of the chest was perfectly normal.

As we have said, it is recognized that a welder may inhale iron dust which may produce a nodulation in the x-ray which is known as "arc-welder's siderosis". But all the evidence indicates this condition is not a menace to health, causes no disability and does not lead to tuberculosis or other diseases. Most of the iron is carried upward with mucus and gradually expectorated. Many men who inhale large quantities of iron oxide welding fumes without adequate ventilation, suffer temporary respiratory symptoms like those of a simple cold or bronchitis. They usually raise a lot of grey, brown or black sputum for a few days and often complain also of cough. All symptoms subside in a few days unless there is some other factor not related to the iron dust.

A large number of men have come to our office, during the great shipbuilding period, complaining of symptoms arising from exposure to zinc fumes. These men are arc welders or burners working on galvanized steel, or they are men of other crafts associated with or adjacent to the welders.

These men generally tell us they noticed a lot of galvanize smoke, that the sucker was not working right or that some careless workman nearby did not have his helper close enough to the work. A little while after the patient arrived home, he felt a little nausea or a sweetish taste, he became very weary and soon had a chill followed by fever. Some are well in the morning. Others require two or three days to recover. If the patient is seen during this temporary illness, a variable fever is registered by the thermometer and generally a leucocytosis is found. That is an increase in white corpuscles just as we find in various infections. Often there is a diminution of vital capacity. Usually the fever subsides in 24 hours or less. Some men have had severe coughing and occasionally the cough has caused vomiting. All symptoms quickly subside however, and we seldom find anything on examination. Rarely the inhalation may be sufficient to produce a severe acute bronchitis or even pneumonia, but these cases are a drop in the bucket when the number of men exposed is considered. No one has been able to show that any permanent changes occur in the breathing

apparatus. All patients seen by us in this connection have been put through a routine examination consisting of the following: examination of nose, throat and sinuses; physical examination of the heart and lungs; B.P. reading; vital capacity; urinalysis; sedimentation rate; fluoroscopic and x-ray film of the chest. We have been impressed by the fact that in the large majority of cases nothing abnormal is found except minor things having no relation to industry, which may be found in the general population.

Many reports in the literature indicate that men who have had metal fume fever once or twice acquire a certain degree of immunity or resistance to it. I don't feel sure about this myself, as we have seen many men who tell us they get into trouble as soon as they smell the fumes again. This, perhaps, may be explained on the basis of fear. When a man has been acutely ill, even for a few hours and knows it was due to zinc welding fumes, he thinks he is going to be ill again as soon as he contacts the fumes. Yet some do have repeated attacks of metal fume fever and we have had the impression that certain men become sensitized to the fumes so that their only hope of avoiding trouble is to change their type of work and stay away from the fumes. Of course it is highly desirable that every effort be made to prevent the inhalation of smoke and fumes as well as undue exposure to all other occupational hazards.

Inhalation of asbestos dust may produce cough and shortness of breath and occasionally weakness and chest pains. Advanced disease may show blood streaked sputum, cyanosis, and clubbed fingers. It has been shown by many investigators, however, in this country and abroad, that a number of years' exposure is necessary to bring about the above situation.

Meriwether, describing conditions in English plants, showed that a minimum of seven years' exposure to high concentration of asbestos dust was necessary to produce a serious degree of reaction.

In asbestosis, the x-ray film presents a faint haziness throughout the lower lung fields and some evidence of chronic pleurisy is usually seen. In far advanced cases, which we very rarely see, the x-ray shows a diffuse shadow throughout the lung fields which has been compared to ground glass appearance, flecked mottling on a hazy background. Asbestosis does not lead to tuberculosis as silicosis is known to do, but of itself may be disabling or even lead to death. There is little the doctor can do beyond removing the patient from the asbestos atmosphere. Asbestosis fortunately does not show the silicosis tendency toward progressive fibrosis. With mild cases, generally symptoms subside after removal from the danger.

Fibrous glass, glass wool, foam glass and glass board: The first fibrous glass made in this country for commercial use was in Ohio in 1934. So our experience is limited as to time. However, it has been clearly shown by Dr. Gardner and other workers that no pneumoconiosis can arise from exposure to these products because fibrous glass is not inhalable. That is, it does not reach the lungs. The spicules of glass are caught in the upper respiratory passages and promptly carried out. In the state of Ohio where the Owens Corning Fiberglass Corporation is located and where fiber glass was first used commercially, there has not been a single claim for workmen's compensation based on pulmonary disease attributable to fibrous glass. Many men have complained of skin irritation as a result of handling these glass products, and there can be no doubt such irritation is very uncomfortable, but no case is recorded in which any skin disease resulted. This skin irritation requires only several washings with soap

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and water to remove practically all the spicules of glass, as they are very superficial.

Some excellent work has been done here and all over the country in the protection of the workmen exposed to possible industrial hazards and more is yet to be done. In spite of safety provisions, there are instances where the employer is careless or negligent in the use of these provisions and there are abundant instances where the workman is careless and negligent.

The employer cannot be absolved of blame for an accident just because he has put in certain protective appliances, if he has failed to see that they work. On the other hand, the workman cannot conscientiously attribute his disability, accident or illness, to his work if he refuses to use properly the protective devices and methods provided.

A great many men who have come to our office with some complaint admit that they smoke from 20 to 50 cigarettes daily, that on occasion they use an amount of liquor which would certainly render them unsafe to drive a car, and a large percentage of the younger men are trying to get along on five or six hours sleep. These are personal matters, naturally left to the discretion of the individual worker but from the doctor's point of view they often make up the difference between good health and illness. Yet when disability occurs, the tendency is to overlook bad habits and attribute the time loss to the work in which one is engaged.

In the interest of efficient production and for the health of the workingman, it is highly essential that employer and employee consciously exert themselves toward the reduction of disability both on the job and off the job.

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G. E. Jordan: I will ask Drs. Farmer and Slyfield to answer any questions which may be put.

Q Is there any cure for silicosis?

A (Dr. Slyfield) That is one of the things I was checking up on at Saranac this summer. I hesitate to offer any promise when we do not know too much about it. I do not approve of the practice of some publications in getting people excited about cures when the medical profession cannot back them up. Doctors Gardner and George Wright are doing some very promising work in the use of aluminum hydrate in the control of silicosis. They do not claim that they can cure the disease but they feel very definitely that they can stop it - they can stop this progressive fibrosis which has been the bane of the past with silicosis...this tendency of the silicosis nodule to go on enlarging and causing a fibrous mass until there isn't any breathing space left. Drs. Gardner and Wright feel they are getting somewhere and they are using the treatment on miners in the Lake Superior region where they have the miners come down for treatment, simply inhaling the aluminum hydrate for a period of a few minutes for about five months and this, they feel, stops the progress of the disease. It apparently does not clear up the condition already existing. They feel that by using the treatment during the course of employment, they can prevent the development of silicosis.

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Q Dr. Farner: On this interesting discussion of shrinking, was there any opening at all in that small compartment?

A (Dr. Farner) As I recall, there was no forced ventilation, but I am going to call on Mr. Frank Adley, who did the research on that.
(Mr. Adley) The study was made in a compartment having one hatch leading from an adjacent compartment which had only natural ventilation.

Q The reason I say that it is interesting is that at our California operations in 1943 we had considerable difficulty with that very problem and nobody recognized it. We made all kinds of welding tests and overcame welding problems but they did a lot of shrinking on transports below decks and had more complaints about that than anything else. I can well imagine the condition was similar to the one that you describe.

A (Dr. Farner) We can't understand why it didn't come to our attention before. I stole Mr. Adley's thunder because he has prepared a paper on this which will be published in the January, 1946 issue of "The General Industrial Journal of Industrial Hygiene and Toxicology". And I might add that before accepting the article, the editor of the Journal inquired as to the method and control of the entire experiment.

Q It has come to my attention that at several different times physicians have signed industrial reports going to the State Department of Labor & Industries giving their impression that the employee had silicosis. Is it possible for a patient to have silicosis when he has had no contact with anything but iron and had no previous contact, or would that be siderosis? I ask because claims were awarded on that basis after a hearing.

A (Dr. Slyfield) The only thing that can produce silicosis is silica. A man must inhale silica in finely divided particles and over a considerable period of time. It has been shown that even men exposed to high concentrations of silica do not always develop the disease. In a group of 100 men, with plenty of silica in the atmosphere, they don't always develop the disease and practically none of them develop it immediately. It is not possible for iron or any other dust to produce it. Of course, one must realize that there may be some silica in connection with work with other metals. But there really isn't much excuse for labeling a case silicosis unless it is, because no man develops it unless you can see it in the x-ray film, which shows it definitely. A man does not have any symptoms unless it is seen in the x-ray films, so it seems to me that it isn't silicosis unless the x-ray shows it, and regardless of symptoms, if the x-ray does not show it, the symptoms are due to something else, so there is no sense in calling it silicosis.

Q It is interesting to know that many of our welder's complaints are, to a large extent, temporary. With regard to the lead inhalation, is it possible, in burning or welding around painted surfaces, to inhale it and is it cumulative so that it will become necessary for a man to change his occupation?

A (Dr. Slyfield) I believe it is, sir. I think it is a source of considerable difficulty. It is perfectly possible that in the burning of lead-coated surfaces, a man may in the course of time inhale enough to cause trouble and it is cumulative. Now, I believe we are using mostly synthetic paints....isn't it becoming a custom to use less and less lead-based paints?

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Q Is there danger to the lungs in the fine sanding dust from woodworking operations?

A (Dr. Mayfield) I would say that it is quite possible for a man to develop silicosis in that way. I remember in connection with the sandblasting of buildings we used to see cases of silicosis. Again, it was surprising how small a percentage of men seemed to suffer from it even though they were exposed over a period of time. Presumably this was because the dust is carried out by the lungs. Certainly, if you have silica-sand dust I would consider it a silicosis hazard.

Q On shrinking, again, I notice on your charts it is dangerous to life in concentrations and animals were killed. Was anyone present in those compartments and what happened?

A (Dr. Warner) There were three men working in this room for some two or three hours. (We duplicated the conditions later.) For some unknown reason all three of them became ill. One died of pneumonia and the other two recovered. That is the thing that started us looking around and that is why our work was done. Naturally we had our suspicions as to what happened to them, and I might say the fatal claim was submitted to the State of Washington Department of Labor & Industries and compensation was granted.

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"VENTILATION"

INTRODUCTION - O. E. Jordan: For some of the work being done on the prevention of occupational diseases I am going to call on Mr. Franklyn W. Johnson, Safety Director of the Kaiser Shipyards, Portland Area, Portland, Oregon.

As most of you know, Mr. Johnson was loaned to the Maritime Commission as a safety consultant and in that position he studied the methods being used in all the shipyards on the West Coast.

FRANKLYN W. JOHNSON, Safety Director
Oregon Shipbuilding Corp., Portland, Oregon

I am afraid, gentlemen, that I am going to be a poor substitute for the listed speaker, Dave Kaye, of our Richmond Yard. I may have this, however, that he hasn't: For a year I spent my entire time visiting contract shipyards on the West Coast. That was in 1943 when ventilation problems were at their peak. You will have to have a little background to understand that.

You must stop to think that in 1940, outside of Navy yards, there were some 5,000 men engaged in shipbuilding and repair on the coast, employed by firms who had done ship work over a period of years. In 1941 when the Maritime Commission started to expand their program they enlisted the services of a number of large operators in heavy construction work and tried to make shipbuilders out of those people. They built up tremendous organizations - 100,000 people in a group. In 1943, when there were half a million workers in the shipyard industry on the West Coast, nearly 70 percent were under the direction of these heavy constructors. They had no idea of the hazard of shipbuilding. They had to learn and learn the hard way.

There are two general problems in shipbuilding:

In those yards where a hull is on the ways a period of months and at the outfitting dock a month or two, you can set up a system of ventilation that will stay put a reasonable time. Where the ships are in the ways a week or so, nothing could stay put more than fifteen minutes at a time. Ventilation problems were tremendous in these yards.

Lack of equipment; buying equipment from ventilation and blower people who were working on an A-10 priority and trying to supply a [illegible]: you can see what the shipyards were up against. Under the circumstances they had to use a fan and then stay out until the air cleared. Conditions were bad and we had many complaints, and justly so. But it didn't take long before each yard developed a system of ventilation for its particular type of construction.

I had the privilege of visiting practically all contract yards on the West Coast and I made a list of some of those yards which I thought presented a good plan of ventilation:

Cal Ship, for instance, in their Liberty program developed a system of ventilation that was remarkably good. They assigned a competent engineer to design a ship ventilation system first, one that would be coordinated with their construction program, and they built equipment to fit each step and made each part standard so that at every stage they could

assign certain fittings to ventilate each stage of construction. That system worked very well. It was practically all dilution ventilation, very little exhaust. Almost all of it was forcing air in, in quantities great enough to force out or dilute the bad air.

Western Pipe and Steel Company set up trunks from the inner bottoms which were 2 ft. in diameter with big volume blowers. At every deck level they had another section.

Other ships were built by combination ventilation, blowing in at the bottom and sucking out at the top.

Swan Island used the same blowers with different fittings, with metal ducts at the bottom of each tank and exhausted from the top corner of those same tanks very successfully. They could work men at 15-foot levels all the way up by that system of combination forced-bottom and suction-at-top ventilation.

Every shipyard developed a system that fitted its particular program. The Navy Yard, by and large, used suction ventilation because they had more galvanizing welding. Many of those yards used a system of small blowers, 500 ft. capacity or less, to draw from the immediate area to a large sucker and blow it out into the air.

That is the program generally followed on the West Coast. Each yard used a system of its own. Each yard had its own problem and each eventually whipped it in its own way. They developed an adequate ventilation system. Some of them had a more difficult problem than welding fume ventilation to take care of: those yards building floating drydocks had a difficult problem with vertical hatches and paint fume ventilation and in nearly every case they used dilution ventilation.

As I am only giving you a brief outline of what went on, that is all I care to say.

- ADJOURNMENT OF DECEMBER 13th SESSION -

A presentation of a coordinated program by personnel from the Puget Sound Naval Shipyard.

LT. E. L. CARLETON, U.S.N.R., Discussion Leader.

Lt. Carleton: As a matter of introduction to the two men from the Navy Yard, I would like to make a few comments. It has been my reaction that oftentimes safety engineers have a perspective that is somewhat on the order of the renowned bird that always flew backwards because he didn't care where he was going but liked to see where he had been. Our safety organizations have been built up after the need has arisen. In other words, industry was here before safety and we had to go in and lock barn doors after the horses had been stolen. Further than that, even in the war era, when there was considerable emphasis on safety, I, personally, know of no single instance where an organization was built up with a safety program planned and engineered into it at the outset. Some of them had a thought towards safety, but the growth of the program in those establishments in later years was much greater than they had anticipated at the start. But again, it has been a process of locking doors to try to mend faults and hazards that have existed by the nature of the operations. Further than that I think the engineers themselves have been lacking in experience and education to know how to plan ahead. Another observation is that frequently, as safety men, we over-emphasize safety and make a fetish of it to the point that it becomes an independent program that has no part in the general operation of the plant we are working in. I think that is wrong. If it has to be independent and can't function as an integral part, it has no place or part in the plant.

We must be practical. The only reason we have safety is because it is economical. If it weren't, we would all be out of jobs. One example of this forward planning I think we all should do, is one of the shops in the Puget Sound Naval Shipyard known as the Service and Maintenance Shop. I doubt very much if that shop was put into existence because it had anything to do with safety. It was brought into existence because it was an efficient way of getting a job done. Incidentally, safety came along with it, but I doubt very much if the Safety Officer had gone to management and said "we want it because it will provide safer working conditions." It was an efficient operation, a better way of doing the job. The history of this shop, as I know it, goes back some 20 years. In the old days, however, it wasn't an independent operation, it was a group of various shops detailed to do certain things that had to do with preparing a ship for repair. Later, sometime around 1940, it was set up as an independent organization and it was responsible for all temporary installations aboard ship.

We have two gentlemen to talk to you, the first, a Quarterman in Shop 99, the Service and Maintenance Shop. He is going to tell you a little bit about ventilation, tank testing, etc. Later we will have a leadingman electrician who will give you some idea of how they go about setting up electrical wiring on the ship. Mr. Frank Wilson, Quarterman, Shop 99, will give you his story on this problem.

FRANK WILSON, Quarterman, Shop 99
Preparation Service Shop, Puget Sound Naval Shipyard, Bremerton, Wn.

Mr. Chairman and Gentlemen:

Prior to 1940 the temporary services in the Navy Yard were under the jurisdiction of the Electric and Pipe shops. These services consisted of temporary power, air, water and steam. They were considered a necessary evil and were taken care of by a few journeymen with plenty of helpers. The ventilation was minor.

In 1940 the temporary services were set up as a branch shop of the Central Tool Shop and consisted of three divisions: electricians, pipefitters and ventilation men. The equipment was built up until at the present time this shop can cope with nearly any emergency that may arise. The ventilation department was new and had to be built from the ground up. Unlike the safety organizations, as the Lieutenant has pointed out, who looked backward to see where they had been, we, of the ventilation, had to look forward as we had never been anywhere.

The first ventilation program in the Yard was fostered and begun by Mr. Jack Fellows, who is now Safety Engineer for the Thirteenth Naval District. From practically nothing, either in experience or equipment, we have, I think, made somewhat of a record for ourselves in the ventilation field. We have a nice organization of capable men, and have been very fortunate in securing supervisors who were tremendously interested in the job to be done, men who saw the need for the work and extended themselves to give service of every kind. We never refuse ventilation service to anyone as long as it is within reason and can be installed safely. We have made it a point to work as closely as possible with our Safety office and I believe Lt. Hazen and his associates will attest to that. The cooperation we have received from the safety crew leaves nothing to be desired.

Our first operation in tank work aboard ships undergoing repair is the testing of spaces for hydrocarbon gases and oxygen deficiency. For this work we employ the M.S.A. Model 2 Explosimeter and either Wolfe or Kohler Safety Lamps. The explosimeter is very handy and easy to keep in condition. We have one mechanic who spends practically his entire time keeping this testing equipment in proper working order. At present we have fifteen men qualified to do the testing. The men have been trained under the supervision of the Yard Chemist and in accordance with the yard regulations. Men chosen for this work must signify a willingness to take the job before the training begins, because it is a hard job requiring a great amount of climbing and travelling about the ship. We require that he go to the job with his mind perfectly open. He must not have any preconceived ideas about the air conditions within the compartment to be tested, and he is not to engage in arguments relating to his work. His supervisor will settle anything of that nature. He must be satisfied with his tests or do the work over. It is necessary that he be so satisfied with his tests that he, himself, will be willing to work in the compartment. I believe, because of this policy, we have a crew of conscientious, hard-working men. We do not need as large a crew of testers as to maintain, but it is a good idea to change the men, shifting them to ventilation work for short periods. Our practice has been to keep two testers on major ships, while one man easily can care for several small units. Our tester goes aboard ships when they first land at the pier to ascertain if the ship's force has anything to be tested. After that the jobs are done on call from the various crafts concerned.

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Frank Wilson - continued

Oxygen deficiency has been our major concern during this war, especially in ships coming from the South Pacific where they have been subjected to the hot tropical climate. The air in most void spaces has been found to be bad. Also, by reason of leakage, the hydrocarbon gases have been more abundant. We expect the oil tanks to show gases, and they are shunned by all until they have been thoroughly ventilated. But workmen are liable to go into voids without calling for tests. For this reason the tester must do a lot of missionary work besides answering the regular calls. He has a routine of testing morning and afternoon on tanks and spaces already opened. Danger boards are provided having a rack attached into which the tester slips a card stating the per cent of hydrocarbons and content of oxygen. The time of the test is noted and the card signed.

For the testing of carbon monoxide we use the regular M.S.A. testers. It is not possible to indicate how many tests have been made for this gas, but to date we have encountered but four instances of contamination. The highest percentage has been four one-hundredths of one per cent. I had the opportunity of reading the report of the Royal Chemist of the British Navy regarding Carbon Monoxide in naval vessels. After making some ten thousand tests he found one instance of carbon monoxide, five one-hundredths of one per cent. We beat the British that time. I believe the rarity of this gas is due to the fact that we ventilate first. But we are constantly on our guard.

We have the job of blanketing tanks with CO_2 gas for welding operations. The instruments used for testing in connection with this work are the regular Orsat and the Mare Island type tester. The Orsat is rather fragile and we have made a practice of using it only to check the Mare Island tester. This instrument consists of a steel cylinder about four inches high and two and one-half inches wide. It has inlet and outlet tubes and a vacuum gauge. It contains 250 cc. of 40% K.O.H. and 30 cc. of kerosene to act as a seal. It is rugged and easily used. The ideal condition under which to start a CO_2 job is with the oil level eighteen inches below the deck beams; although the job can be done under about any condition, with the oil level anywhere below eighteen inches. The gas is introduced into the tank through the sounding tube or any other opening. A temporary vent must be run to the topside. Samples are taken from the outlet until a concentration of 50% is reached. The filling is then discontinued, the vent closed and the gas allowed a period of thirty minutes to diffuse over the surface of the oil. If possible a pressure of one to two inches of mercury is maintained during the welding operation. This is not always possible because of leaks in the tanks. We have welded many tanks without pressure. There is nothing complicated about the process except that no two jobs are ever alike. This means that a varied stock of equipment is required. We have accomplished around a thousand jobs of this kind without mishap of any sort.

To take care of the various services we supply, we have call boards that are placed on the main deck. These boards have pads for each activity. The workmen indicate their wants, giving the location of their work. The boards are checked constantly so that no man has to wait for service. We store plenty of ventilation gear aboard when the ship arrives. In the case of a major ship we install our Sturtevant 6800-foot units as blowers and suckers. These blowers are installed on the main deck and sheet metal ducts run into the ship wherever we can get down. These ducts are fitted with an adapter made to accommodate fifteen five-inch tubes which

can be further reduced to thirty three-inch tubes. In this way we can reach nearly every part of the ship with exhaust and supply. We use a velometer to test our volumes and velocities. By this means we have a good check on the efficiency of each tube.

All our work in the yard is governed by a set of regulations to which we adhere very strictly. Pneumatic blowers are used exclusively for oil and gas tanks. This is exhaust ventilation only. We do not blow into tanks in spaces that would cause a contamination of other parts of the ship. To furnish fresh air to such compartments, we introduce fresh air into the space above and draw it in by exhausting from the tank or space below.

For other ventilation we use a 550-foot Sawyer electric blower. This machine has two intakes for three-inch tubes and a five-inch outlet. It is portable and performs very satisfactorily. This type is used, along with the pneumatic, on destroyers and other small vessels. It requires a crew of six to eight men to maintain the ventilation on a major ship, while one man can service a destroyer.

The ventilation crew does not open any tanks. This work is done by shipfitters. It is the duty of the man wishing a tank opened, to arrange to have the work done. This procedure allows us time to have equipment ready to install as soon as the manhole cover is lifted. The tube is dropped to the bottom of the tank and the exhaustion begins, allowing little or no atmosphere from the tank to escape. Before anyone enters, the tester will complete his work and post his finding on the tank board. As long as a man makes his want known he is taken care of as quickly as possible in accordance with the regulations and safety rules.

No man should be allowed to supervise the ventilation crews unless he is thoroughly safety minded. He is the man who must train the crews and safety is his first concern. The ventilation equipment must be installed safely and maintained in that condition by constant patrol. He is a safety man from the time he comes on the job until he leaves it. No man should be left on a crew unless he can, and will subscribe to all the safety rules. If he cannot do this he is a menace and sooner or later will cause trouble throughout the whole organization.

Oil tanks are steamed for varying periods, washed down and cleaned. After thorough ventilation and testing they are ready to be worked in. The ventilation and testing, however, are continued as long as men remain in it. Gas tanks are subjected to seventy-two hours of steam before cleaning. The greatest care is taken to eliminate all hazards. While men are in or about the tanks constant checks are made by the tester. He also makes periodic tests until the tanks are closed whether or not work is being done.

We ventilate for the sandblasters, using a 7000-foot Sawyer Whirlwind blower. This is rigged to a twenty-inch sheet metal duct which runs into the tanks through the hull of the ship. A fog nozzle is used on the outlet side to kill the dust. This procedure has reduced the sandblasting time by about twenty per cent.

I would like to mention the air, water and steam services. These services are not under my supervision but I can give a brief resume of them. Air hoses are connected as soon as the ship docks. Manifolds are placed

fore, amidships and aft. As soon as possible thereafter, air lines, 1½-inch pipe, are run on both sides of the ship on the main, second and third decks. Manifolds are placed at close intervals with extensions running farther down below decks. This service is generally completed in two days.

Steam lines are run for heating, laundry, galley and various other uses. Temporary fire lines are strung about the ship with convenient outlets. Mr. Granstad, quartermman pipefitter, has worked out an efficient system for the installation of their services. A major ship can be completely fitted out in three days.

I believe that about covers the subject, Mr. Chairman. Thank you.

"SAFETY IN SHIP REPAIR" - PART II.

Lt. Carleton: The next speaker is Mr. Ernest Porter, leadingman electrician from the same shop, who will give you some ideas on that particular phase of the subject. After he is through there will be ample time for any questions you might wish to put.

ERNEST PORTER, Leadingman Electrician, Shop 99
Preparation Service Shop, Puget Sound Naval Shipyard, Bremerton, Wn.

Mr. Chairman and gentlemen:

I represent the electricians in Shop 99. As Mr. Wilson pointed out a few minutes ago, this organization was formed in June, 1941. At that time we were under separate shops and I happened to be in this shop at the time. Our equipment consisted of salvaged material from the parent shop. It was none too safe. We had open switches and cast-off cable, but the equipment was the best we could get. When the Service & Maintenance shop was formed, our equipment improved and we have been able to afford better service as a result of being in a separate shop.

It is the duty of the electricians to install and maintain in a safe manner, all temporary electrical service used aboard ships undergoing repair or construction. Included in our service is supplying ship's power. When the ship comes in we have our own leads laid out to the dock where it will berth. This facilitates hooking up. We know from experience what the load will be on each particular ship and by having our own cables out, we are assured of having proper size, length, and lugs for connecting. Electricians aboard ship generally handle their ends of the leads, the reason for this being that gangways are not down. They toss a heaving line down, haul the cables aboard and in a few minutes the ship is ready to take power from the dock. On the dock we obtain clearance from the power plant for the circuit on which we will connect, and the circuit will be dead when the ship arrives while men aboard are working on it and we are connecting our end. However, before cutting in we make a practice of getting aboard and inspecting our connections. There are some instances of unsafe equipment with respect to shore boxes having magnetic locks. These magnetic locks on 440 V. ships are dynamite. We have had casualties because the leads supplying the magnetic lock coils do not have fuse protection and when the lid is closed the lead is pinched and a flash short-circuits the box. The Design Section has approved removal of these locks.

Our duties also include installation of temporary communication lines aboard ship. The telephone switch-board is connected to the shore-side switch-board by portable cables. We have telephones available for the captain and officer of the deck the first thing. Then the hull superintendent or the production officer may authorize installation of additional phones. On small ships, however, you generally will have only two phones. On larger ships we have installed radio relay leads, teletype leads and ten or fifteen telephones.

Another of our duties is the installation and maintenance of welding equipment. In the Navy Yard they have used multiple welding equipment extensively since 1940. Prior to that we had considerable difficulty with single-man machine leads due to the many leads going aboard interfering with people working over the side of the ship. By using multiple welding equipment, those service leads are concentrated.

Some pertinent facts concerning welding: We must keep our grounds and leads attached to the same ship. In other words, it is not permissible to weld on two ships with one machine. A Bureau of Engineering letter warns that stray currents flowing between ships might cause damage to hull paint and propeller shaft bearings. On welding jobs on directors or any other equipment mounted on ball bearings we usually use single-man machines, running both leads to the director, eliminating any current flowing through the bearing bed. We have been using glass and nail-shooting guns for the past few years. These are generally used on single-man machines of 300 amp. capacity.

Another service is the installation of temporary lights and power. Regardless of the type current which a ship uses, we run a three wire 125-250 V. direct current circuit for temporary lights and power. This current is distributed from a central location on the ship. The switch stands allow a concentration of service at one location, cutting down leads and giving adequate black-out control. In other words, two switches at the most will supply all lighting topside. One man could throw the switches in an emergency.

A lot of the portable equipment consisting of electric drills, boring bars, boiler tube turbining motors, stud welding gun control circuits, some types of ventilation blowers, battery charging and etc., use direct current. However, there is some alternating current equipment used aboard ship including dock planers, portable saws, single-man welding machines, and Ship 99 ventilation equipment. As a result, we generally run direct current for lighting circuits, but we also run [illegible] aboard for ventilation purposes and that supplies a lot of our portable equipment. We have a good deal of work to do in connection with drying out motors and have available 4,000 W. fan heaters for that purpose. On ventilation supply we use a grounded system carrying the ground from the switch stand to the last machine on the line. We generally use 40,000 circular-mil 4-conductor cable for supplying the plug-in boxes.

With regard to the safety angles in this work, the first and most important safety rule is never to work a hot circuit. Anybody who violates this rule is removed from the gang. In hooking up the ships we have taken precautions, through obtaining clearance from the power plant on any circuit we are working on, and the circuit is not energized until we are assured that everything is safe.

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Some ships shore power boxes pose a real problem because they were improperly designed and insufficient clearance was allowed for hooking up. Generally that can be remedied by using rubber strips, which we cut from old inner tubes or similar material.

Temporary circuits installed aboard ships by Shop 99 are controlled by our own switching arrangement. When working circuits supplying the shipboard circuits, we work in conjunction with the power plant operator who performs the switching operations ashore. When working our own switch stands and when working on a circuit, the electrician tags it out. If he has sufficient time, he removes fuses. The switch is opened and no one can close it except the man working on the line. Another safety rule is that all circuits should be protected by proper size fuses.

Our portable lights are connected into 3-pole plug boards grounded to the bulkheads. The plug boards are convenient in grounding small portable equipment. All portable equipment which does not draw over 15 amps, is protected this way. Our ventilation system is grounded usually by the switch stand being grounded to the ship, since we carry our ground back to the switch stand.

Proper identification of switches is important from the standpoint of safety and it also facilitates switching operations. It eliminates mistakes and in case of high voltage switches, it gives ample warning. On our shore boxes we have put tags "Danger, 440 Volts" and our switches supplying 440 volts to the ships usually are painted red. They are 500 V. Underwriters approved switches. Generally we use 250 V. switches on our lower voltages.

The Safety Office has also stressed the necessity of keeping leads off the deck. To accomplish this, we use metal trees standing about eight feet high. These are placed top-side. Sometimes we must move the trees and the loads get slack, which necessitates rearranging loads to keep them the proper height from deck. Keeping leads off the decks not only removes a tripping hazard but helps prevent fires and damage to electric cable. We have every voltage from 32 up to 440 and a person never can be sure of the voltage of a load lying on the deck. It is important to remember to leave plenty of slack in shore leads. If the ship arrives at low tide and you do not have sufficient slack to compensate for rise in tide you may have trouble when the tide comes in.

If a ship is in drydock or on the ways, we always run a static ground line aboard ship and connect it to a salt water pipe on the dock. There have been instances on ungrounded ships of stray currents flowing between the hook of the crane and through the crane to the ground.

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* - Regarding the types of unsafe shore boxes, it is suggested that Mr. A. W. Moe, Qtrmn. Elect. of Shop 99 be contacted. For several years he has collected pictures of the unsafe shore boxes and has taken the matter up with various people in the Yard who might be concerned with the altering of these boxes.

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The last point that I have in mind concerning safety is the protection of all exposed switch boards. In the Navy Yard this is accomplished by erecting plywood stockades around the boards. Room must be left for the electricians to work, but the boards must not be too accessible to other trades.

In closing, I should like to say that we have been exceedingly fortunate in that during the past four and one-half years we have had nobody burned. I believe this is due to the fact that every man understands that he is working with an unknown quantity until he tests the circuit he is working on with his voltage tester.

QUESTIONS

Q Mr. Wilson spoke about blanketing tanks with CO_2. Is that used for any purpose except fire?

A Yes. The exterior of oil tanks can be welded by using a blanket of CO_2. The oil level in the tank should be 18 inches below the lower edge of dock beams. The CO_2 is run in until you have a concentration of at least 50%, which will eliminate fire and explosion hazards. This method isn't recommended for gasoline tanks, however. I have counted up the number of tanks that we have blanketed since we began using this method and it runs to some thousand tanks and we have never yet had a casualty or fire.

After the tank is blanketed, we tag it, stating the name of the man who worked on it, and other information. Unless someone must enter the tank, the CO_2 is not removed, it goes out the vent.

Q Mr. Wilson: What do you do when you have to weld inside tanks?

A They must be steamed and cleaned. After the tank has been steam-cleaned and tested for welding operations inside, it is O.K.

Q Mr. Wilson: On shore steam lines connecting with the ship, what kind of steam hoses do you use?

A They use all metallic. They have tried rubber hose but haven't had much success with it.

Q Is any kind of rubber hose good for steam?

A They haven't found anything yet worth buying and they have tried many brands.

Q Have they made any tests with asbestos coated steam hose?

A I don't believe so.

Q Mr. Wilson: In using the CO_2 blanket, if the tank is only partially full, do you put more oil in?

A If they have oil on board and can sluice it, we put the level up.

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Q If not?

A Then we blanket it anyway. It doesn't make much difference how much oil is in there just so you have at least 18 inches clearance. We weld any place on the tank. We have welded tanks in every conceivable condition and have never had suspicion of danger.

Q Supposing you have a beam and put your CO_2 in on the side?

A That is why you have to have your clearance, so that the CO_2 can go clear across the tank. We try to put it in on one side of the tank and take it out on the other. We may take the lid off and drill it and put a fitting in with a long pipe so that we can squirt the CO_2 back away from the vent. The gas is heavy and diffuses over the top of the oil, as it fills, the tank atmosphere is completely changed.

Q What concentration do you use?

A A minimum of 50% and try for 2-inch pressure on a mercury gauge.

Q We use that method but it isn't approved by the Board of Fire Underwriters - I am from the Matson Navigation Company.

A I know.

Q We had a condition in Alameda where the city fire chief would not permit the Navy to do that on the island because it wasn't approved by the National Board of Fire Underwriters and in the event anything happened, the insurance contracts in the city and workmen's compensation might be voided. The procedure that is followed in Alameda is that a certified, registered chemist must issue certificates and he will not jeopardize his license by OK'ing a tank for hot work unless he knows what he is doing.

A We are not up against that, and have the backing of the Navy and our chief chemist. They consider it a safe operation. As I have stated, we have used the method on some thousand tanks in all kinds of condition with the exception of gas because there is too much danger of a man burning a hole in the tank. As far as I am concerned, the method is all right.

Q Do they allow you to weld on fuel oil tanks below 1 foot from the surface without a blanket of steam?

A No sir, not at all. We do use the steam blanket but not very often and we don't use it any place where you would ruin equipment with the heat.

J. W. THOMSON, Safety Director,
Bethlehem Steel Co., Shipbuilding Division, San Francisco, Calif.

Members of the Pacific Coast Safety Conference, Guests:

The subject of staging deals with one of the most important items of equipment for the safety of workmen, regardless of where the work is to be performed or whether it is new work or repair work; and most of us now are going to be actively engaged in repair work.

Staging is, as I have just said, very important to the safety of everybody in the shipbuilding business and the State of California, to that end, has paid special attention to the subject and broken their safety orders down into a great many different items concerning staging. They have departed from their old original set of orders written in 1921, and incidentally, I was on the committee which helped to write them at that time, and they have made several revisions and modifications of the original orders. The orders now begin with a chapter on "Definitions" in which the more common terms used in staging erection are explained, such as Horse, Life Line, Lumber Dimensions, Platform, Safety Line, Scaffolding, Service Line, Staging, Standard Guard Railing, Stock, Table, and Toe Board. With these terms standardized there is little or no chance for misunderstanding.

A separate paragraph designates the grades of lumber to be used as specified by the West Coast Lumbermen's Association Grading Rules No. 11 and the Western Pine Association Standard Grading Rules 1939.

The orders then continue by designating Building Ways Scaffolding and Staging, Deck Staging, Prefabrication Staging, and other miscellaneous exterior and interior built-up staging. Painters' staging comes under a separate heading; and exterior suspended staging other than painters' staging.

I thought perhaps I might give you an idea of some of the things they have incorporated in these new orders. I don't know what you have here in Washington or Oregon, but I do know we are credited with having about the strictest commission of any state in the United States concerning workmen's safety.

We have shipbuilding staging on the ways which, of course, consists of the uprights, spalls, planks of specified dimensions and specified materials which must enter into that staging. Then we have the painters' exterior staging, deck staging, exterior suspended staging, horse staging, interior shell and bulkhead staging, exterior floating staging and intermediate staging, that is, staging erected upon an already existing staging. In the drydocks we have a type of staging which is, to our mind, a very adequate piece of equipment in the form of a portable rolling staging. It is built of steel angles with adjustable spalls and large Timken bearing equipped wheels making it readily rolled from one part of the drydock to the other.

In the new construction shipways, staging is placed in the spalls and uprights and the guard rails are fastened to the uprights. We are all familiar with that. In hanging staging, which is used extensively in repair work, we have been confronted with a lot of difficulty in attaching the guard rails which the Commission insists that we place, and which certainly should be placed. We experimented at great length with the fittings

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of these stanchions. We had the long spalls extended out in order to permit a stanchion to be bolted or nailed and then would have a diagonal brace for support; but that occasioned too much work and trouble with the result that a lot of the staging riggers didn't want to put it up. We finally hit upon a good idea and I have pictures to show how simple and readily attached and taken down this steel stanchion can be.

(Note: Pictures were passed around at this point)

I think you people, if you care to, might incorporate that in your work. These stanchions are made from 1/4 inch 1½ x 1½ inch angle iron. The bottom of the stanchion is fitted with two 5/8 inch bolts spaced and welded so as to straddle the 6 inch side of a standard 4 x 6 inch spall. The stanchion is held secure by means of a 1/2 inch washer plate and two 5/8 inch nuts. It is necessary that this plate be of not less than 1/2 inch stock in order to have a minimum of bending moment. In order to eliminate side movement of the stanchion on the spall two 3/8 inch pointed pins 1/4 inch long are welded between the 5/8 inch bolts on the stanchion proper. The stanchion is 46 inches high and carries two welded staples through which the wire cables can run in lieu of backrails. As a matter of fact, if you made the stirrups wide enough you could use the wooden backrail but we prefer wire cable. We have found this very satisfactory, readily placed and taken down and it has received the approval of our Commission.

The fact that the staging may be properly erected and maintained does not prevent staging accidents and I am going to cite an instance where a fatality happened in our Alameda Yard to a stage rigger who was handling staging in the wrong way. He was up 48 feet and was about to change the position of the staging, and in order to loosen a wedge he had taken a claw hammer and sharpened the claws to use it as a spike. He intended to use this to loosen the wedge, aimed a blow to sink the hammer claws into the head of the wedge, missed the wedge and catapulted himself to his death at the bottom of the ways.

This type of accident should not happen in any yard and can be prevented by proper supervision and training. Claw hammers should never be sharpened and used for movement of lumber and had the foreman or loading man stopped this practice at its inception there would not have been an accident. In our San Francisco Yard, especially on work aloft, we are very particular that the equipment and procedure used in handling lumber and all material is in accord with the best safety standards.

We have not had any serious accident in the San Francisco Yard in many years resulting from faulty staging and we like to think this is because we pay particular attention to this matter and never accept a load of specified staging planks until they have been thoroughly inspected and culled over. The ones that pass inspection and are deemed fit for staging planks are put in a separate pile and no one can go to that pile without an order from the mill foreman. The same is true of spalls. That is the way staging materials should be handled because just one plank can cause a fatal accident.

With regard to painters' staging, we are permitted to use a single plank. This type of staging is restricted to the use of painters only. All other staging for other crafts must be three feet wide of 2 x 12 planks or four 2 x 10 planks except in a case where space will not permit

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the introduction of three or four planks and then a special exemption must be obtained from the Industrial Accident Commission.

We ran into that problem on some destroyers because the ways were built of a width to accommodate a merchant vessel or cruiser. In order to speed up production two destroyers were built abreast in one slip and that curtailed our beam dimension so that we couldn't get more than two planks between the two vessels to serve the inside side of the erection of those hulls. We couldn't put up the uprights to the specified "not less than three foot width" so we had to construct a special steel upright of a narrow width which was approved under a special exemption by the Industrial Accident Commission. Of course that was served with the standard back rails 42" high with the center rail 18" between.

A lot of time could be spent talking on staging because there are so many varied types of it but I will go into a paragraph here indicated by "Floating Staging" which "shall be supported by fixed uprights and spalls equivalent in strength to those required in the shipway staging and these shall be attached securely to the floats." "All staging shall be protected by guard rails as required in the hand rail order."

Now we have "Exterior Suspended other than Painters' Staging" which "shall be suspended by means of wire rope or steel suspenders or stock of equivalent strength, excluding structural reinforcing steel. The platform shall be not less than 36 inches wide, and shall be provided with a standard guard railing, on exposed sides and ends. Rails shall be of 2 x 4 inch lumber or stock of equivalent strength. If wire rope guard lines are used instead of wood rails they shall be kept taut at all times.

"At no time shall fiber rope be permitted to form a back rail or guard line."

On the ends of all spalls "a galvanized iron or steel bolt six inches long and three-eighths inch in diameter shall be fastened through the spall or bolster at right angles to same, not less than three inches from the end, and half way between the upper and lower sides to prevent hails or slings when used from accidentally slipping off the end of the spall".

Now talking about staging does not eliminate the need for the protection of deck openings and open decks because there, again, is the need for a standard guard rail with an intermediate rail. As a matter of fact, that is just as important as the exposed sides of a ship. Specifications there are identical with the ones required for the staging itself, and in the erecting and maintaining of staging "no staging shall be erected, moved, or altered except by experienced men to whom such work is customarily assigned."

Too often, upon investigation, you will find that somebody has altered staging or erected one of their own accord and usually it is not according to specifications.

"No unnecessary equipment or debris shall be permitted to remain on any staging when its presence on such staging creates a hazard.

"No welding, burning, riveting or open flame work shall be carried on, on any staging suspended by means of fiber rope.

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"Staging shall be maintained in a safe and secure condition."

Now we come to an important part, that is, in taking the staging down and stripping the ship. Too often men get upon the top courses and slide the planks in such a manner that they may fall. "In stripping staging, boards and timbers shall be lowered by means of lines or by hand. Such material shall not be dropped free of restraint.

"Partially erected or partially dismantled staging shall not be used unless the part used is a complete staging under these orders and all open sides and ends are protected by standard guard railings."

I think Ed Lange has a few words he might want to bring in here with his experience in the Alameda Yard where they are building those 22,000 ton ships, the big transports.

E. V. LANGE, Safety Engineer
Bethlehem Alameda Shipyard Inc., Alameda, Cal.

Gentlemen:

Mr. Thomson has suggested that I make a few comments on staging and the problems connected with it at our yard.

Shortly before the war started, I went to work for Bethlehem Steel Company's San Francisco Yard, and, with the guidance of Mr. Thomson, had a chance to pick up a little experience before being sent to the new Alameda Yard. With our top management keenly interested in accident prevention and with the opportunity of getting in on the ground floor, we felt that we would not have to be like the bird already described who flew backwards to see where he had been. The great majority of our key men were understudies to the supervisory forces in our San Francisco Yard. Being out on their own, having a lot of ideas of their own, wanting to make good and yet feeling their way along, made these men rely on one another, and consequently, we had "good teamwork". Using the experiences gained at the San Francisco Yard and citing the accidents we had experienced there, we tried to use foresight to lower our accident rate at Alameda.

As Mr. Thomson stated, we were building 22,380 ton transports at the Alameda Yard. These ships are approximately 610 feet long. There are eight courses of staging on uprights towering 70 feet above the headhouses serving the hulls. At launching, the hulls slide into the estuary which is approximately a 900 foot channel. Drag chains had to be used. Consequently, all staging and uprights had to be removed and erected again.

During our building program we were most fortunate in having very few staging accidents. The laws of the State of California are very stringent with regard to staging, and supplementing our own inspections, we have had regular weekly inspections by a state inspector. We found it necessary to train the workmen and familiarize them with the State orders. For the most part, we accomplished this through Departmental Safety Meetings. Frankly, it is the man out in the yard who does the job who must recognize the problem, and if you can get him to work with you, you can for the most part solve it. Of course, management must help.

With the revision of the California staging specifications, we have found a problem confronting us in regard to the mid rail. The mid rail now makes it very convenient to use the hand rails as a ladder to gain access to the staging above. It is a problem in human behavior, a case of getting to the workers and making them realize the hazards. We have already had three or four experiences in which workmen have been extremely close to serious injuries because they did not utilize the safe and proper ways and means provided to get to their jobs.

Some of the wrinkles used to cut down costs and get effective safeguards were interesting. I believe there are some 118 penetrations for companionway ladders on the ships. Manholes, trunks, hatches, etc., all have to be guarded. A procedure was developed whereby when penetrations were to be made, the order was given in writing. The Burning Department received the order, and a carbon copy was given to the "safety carpenter", a member of the Shipwright Department, in time for him to prepare in advance a guard for the hole. Through "Job Methods" classes, Job Instruction courses and War Production suggestions, many ideas were developed. Prefabricating sections of guardrails simplified the tasks. Complete guarding of penetrations before sections were placed on the hulls made our job easier.

To acquaint our foremen with the various problems, they served on yard inspection committees and accomplished much in overcoming some of the hazards. They accepted the responsibility for the conditions and worked with each other to correct them.

As Jack mentioned, we did have a fatality connected with staging. It concerned the old practice many of you have observed, that of using the claws of the hammer to move staging or lumber. It is a common way of doing it, but what if the claws pull free? This was one of those two or three minute jobs, raising the level of two spalls in the uprights. Safety belts are available. Why stage riggers will not wear them is another problem. It may be they take pride in doing a hazardous job or they dislike the belts. The men have complained of the added weight of a belt and of the loop catching on projections while climbing.

In this particular case, the man chose to stand on a 3½ x 8 inch whaler, or horizontal brace between the upright, and rest his arm on two planks that were to serve as a portion of a platform to be constructed. The spalls had to be raised one hole (approximately 9 inches) and loosened. In order to remove the wedge between the spall and the small pin, the man sunk the claws into the wedge and gave it a jerk. The wedge moved out but could only be backed out to the edge of the plank. The sudden stop caused the hammer to pull out of the wood, and the man lost his balance and fell to the ways some 48 feet below. He met death instantly.

The reaction to this accident is something that most of you know. "There is the Safety Department, etc.?" It was quite an experience to sit in at the Department Safety Meeting and hear the men discuss the accident. The leadermen and supervisors, after full investigation, decided that the use of hammers as tow bars should be discouraged to the extent of relieving the man from the job after due warning. The practice has been discontinued. However, some weeks later a war production suggestion was made, suggesting a sharpened hinged pin on the side of the hammer head for moving lumber. Needless to say, the suggestion was not accepted.

We have found it beneficial to publicize our accidents, stating the direct causes and getting the departments involved to help work out the corrective measures. Selling everyone on the idea of using safe work procedures has helped knock our accident rate down. It is my belief that we can lick a lot of accident problems if we can get the leading men, supervisors and foremen talking things over and doing something about it.

J. W. THOMSON - continued

At the luncheon at the Chamber of Commerce they spoke of the amazing toll of traffic deaths in Seattle. While this traffic death toll is true of almost every large city, it is with a great sense of satisfaction that nothing like this death rate is experienced in shipyard operations, all of which goes to show that regard for Safety pays big dividends.

I take a lot of pleasure in reporting that my yard in San Francisco last month completed its third consecutive year without a fatality and that with 106,000,000 man-hours of exposure. Sometimes we used to be prone to think that the stringent laws imposed by the Industrial Accident Commission of the State of California were too strict, but looking back on our record I am glad they are strict because I don't think you can impose too many safety regulations in industry and if they are lived up to, our accident rate is bound to be low.

I haven't anything further to say on staging, but those pictures may be of benefit to somebody to pattern after. If they are of any use, you are welcome to make use of the idea.

QUESTIONS

Q How do you reconcile the use of single planks for painters where it isn't allowed anywhere else and isn't consistent with the other staging used? Do you think that the single plank is satisfactory?

A I do, for the reason that it is provided with an adequate back rail and it is a rope tackle suspended staging. It is not hung in a fixed position. It must be hung in the block and falls in order to raise it from one level to another. The painters do that themselves and I doubt if they could raise a 36 inch staging without help.

Q They do on buildings....

A Don't they use a windlass arrangement?

Q No.

A I can't answer as to that, but it is permissible for painters only. I think it is all right where there are only two men assigned to one plank which cannot be longer than 16 feet in length. It would impose a hardship on two men to raise a larger staging without other help. Of course in the drydock, the painters use a rolling scaffold which they do not have to raise at all because there are three or four flights of staging which are provided with proper guard rails.

Q Mr. Thomsen, has the stanchion bracket you described proved a success when they have installed a staging up a mast?

A Yes, very much so.

Q Isn't it a handicap when you have the prongs?

A No.

Q How about taking it down?

A They loosen the nuts, replace the binding straps and lower it down on a handline.

Q It seems that would be a very slow process.

A On the contrary, it is very quick and there is no danger of falling material.

"GENERAL HOUSEKEEPING"

FRANKLYN V. JOHNSON, Safety Director
Oregon Shipbuilding Corp., Portland, Oregon

I don't know if this is premeditated, but usually the last item of business on a conference is spoken to half-empty chairs and because there is such good attendance and this is such a dry subject, I am going to deviate before I get through and "peddle the bull" a little. We have all heard that expression at every safety conference that we go to: that half or more of the value of a conference is derived from an intimate "bull session" after the meeting. Now it is hard just to tell of all the mistakes we have made but we learn from our mistakes. We never learn from doing things right. For that reason I am going to take the privilege of deviating from the topic of shipyard housekeeping. This is about as dry as one-half dozen paragraphs in this booklet on "Minimum Requirements for Safety and Industrial Health in Contract Shipyards". There isn't anything in there we don't know by heart, it is just common good sense.

Good housekeeping generally falls into two problems. One, orderly work procedure and second, waste disposal. How many of you think of that as a problem of safety engineering?

Unless we can suggest or demand adequate waste disposal our good housekeeping plans go right up the flue. Take a yard such as we have: Have any of you any idea of our waste disposal problem during a year? We haul 155 garbage truck loads of trash a day and about twice that amount to the salvage department. Do we think of that as one of our housekeeping problems? It is, and it is a big one. Unless we recognize that and see that something is done about it, all our pleading to the supervisory staff won't get us very far. A foreman is not going to make an effort with his crew to keep an orderly house in a place that is full of trash he can't do anything about. Waste disposal and cleanup is a major problem and should be considered so by management. I recall regarding Coulee Dam, as many of you know, that project was in two separate parts, two general contracts, and an entirely different organization took over the job half-way through on the second contract. It is true most all of the working people stayed right on, but the department heads and general supervisory staff were different and I recall, on the second contract, a very smart concrete superintendent who was going to make a mark in the world, but in so planning, he neglected to provide for adequate cleanup. In spite of all protests of many of us who knew better, he said "we can't be bothered with cleanup. We have got to pour concrete."

How many of you have had that problem in shipbuilding? Ships! They want to build ships! I did try to demonstrate to that man and got him to come out and see the results - we were getting any number of injuries from poor cleanup. I pointed out a block which was ready for concrete and said "now you watch". I tossed a match down right in the corner where it could be visible to all and said "now we will watch where that match is." In a couple of hours there was a truck-load of trash dumped where that match was. All it takes is a start and it grows just like that. It is the same way around a shipyard. You have to keep a place clean and start right at the front gate. It is management's problem. I might say that in some of our yards we do this from management's angle. We can ask for complete paving of all yard areas so that we might sweep them from one end to the other every day - and I mean that literally. Management can do that, but the safety engineer can't unless he has management's approval because it costs

money to hire the people. This is a necessary incentive to people in the yard to keep their own place clean. Management must first provide a good, clean work place and then we can go to the supervisors and ask that they enforce good housekeeping rules such as this book states. We can't ask supervisory people to keep a clean orderly work place unless management is willing to provide a general housekeeping plan that will allow them to do so.

I jotted down this morning five points that I thought were necessary in a good housekeeping program.

First: Management interest in the problem which I have just spoken about.

Second, and this came to my mind when I heard Lt. Carleton this morning: Adequate design of the facilities for the work at hand. That is very necessary. Many of you have worked in old, over-crowded plants and didn't have a chance to put in a modern procedure. You had a pretty hard job to overcome that handicap but it is a necessary factor in good housekeeping - adequate design.

Third: Supervisory cooperation. And other than the point I mentioned about management's part in that, is the problem of the safety engineer to sell to the supervisory staff the necessity for good housekeeping. You could do that by demonstrating hazards, etc.

Fourth: The coordinated disposal of debris. I have already mentioned that and will not go into it further. It is a definite factor.

Fifth: Enough small cans for disposal of small trash - cigarette butts, lunch scraps and the like, waste rags, wiping rags, etc.

These points, along with the two general ones: orderly work procedure and waste disposal are necessary for a good housekeeping program.

- ADJOURNMENT -

DISCUSSION OF PROPOSED PACIFIC COAST SHIPYARD SAFETY COUNCIL

1. At the unofficial joint meeting of Seattle, Portland and San Francisco A.S.S.E. chapters held the evening of Dec. 13, 1945 in the New Washington Hotel, Seattle, Washington, Mr. L. F. Lange, Safety Engineer for the Bethlehem-Alameda Shipyard, reported as follows on the proposed formation of a Pacific Coast Shipyard Safety Council embracing the cities of Los Angeles, San Francisco, Portland and Seattle in a united cooperative safety council for the exchange of safety engineering ideas, etc.

The Northern California Shipyard Safety Council was organized several years ago and for a period of time was connected with the San Francisco A.S.S.E. chapter but for the past year or two this group has been meeting and exchanging safety ideas and problems. Originally the meetings were held in evenings, after work hours. However, management was soon sold on the idea and since then, meetings have been held on company time. Present plans call for the expansion of such shipyard safety councils throughout the entire Pacific Coast region and eventually to the holding of annual Pacific Coast shipyard safety conferences. Mr. Lange outlined other plans and ideas for the promotion of such Pacific Coast affiliations and stated he was anxious to return to California with a message from this conference.

2. At the conclusion of the Pacific Coast Shipyard Safety Conference on December 14, 1945, Mr. L. F. Lange reiterated his remarks of the previous evening. The following noteworthy remarks completed the discussion of organizing a Pacific Coast Shipyard Safety Council:

1. Develop a system of exchanging safety problems and answers.

2. Hold annual meetings and from such sessions make recommendations and resolutions as a group and not as a single safety engineer.

3. The Northern California Shipyard Safety Council meets monthly where presented questions are thoroughly reviewed, discussed and usually answered.

4. Four or five active shipyard men in safety work in the Portland area could handle such a shipyard safety exchange; likewise in the Seattle area.

5. The east coast has seven shipyard safety exchanges. Safety groups travel every three months from one yard to another with one yard acting as host and the individual company paying expenses and the safety engineer of that yard acting as chairman, taking minutes in order that all yards may have the benefit of same.

6. It was suggested that those interested contact Dave Kaye, Chairman of the Northern California Shipyard Safety Council, c/o East Bay A.S.S.E. Chapter of the National Safety Council, 14th and Franklin St., Title Ins. Bldg., Oakland, California.

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REGISTRATION LIST
Pacific Coast Shipyard Safety Conference
December 13-14, 1945

CALIFORNIA:

Ahern, Holland B.	Sr. Safety Engr., 12th Naval Dist., San Francisco
Baxter, Lt. H. J.	Safety Officer, Mare Island Navy Yd., Mare Island
Blackiston, Wm. T.	Safety Engr., USN Drydocks, Hunters Pt., San Fran.
Cutts, Lt. A. E.	Dist. Safety Officer, 11th Naval Dist., San Diego
Estabrook, James E.	Field Rep., West. Div., Natl. Safety Council, San Francisco
Lange, K. F.	Safety Engr., Bethlehem-Alameda Ship.,Inc.,Alameda
Meldrim, Lt. R. C.	Safety Officer, U.S.Naval Shipyd.,Hunters Pt.,S.F.
Sepulveda, R. M.	Safety Supervisor, Matson Nav. Co., San Francisco
Thomson, J. W.	Safety Dir., Bethlehem Steel Co.,Shipbldg.Div.,S.F.
Zepp, Wilbur	West Coast Rep.,Scott-Air Pak (Aviation Co.) Culver City

OREGON:

Johnson, Franklyn W.	Safety Director, Oregon Shipbldg. Corp., Portland
Moreland, J. C.	Safety Engineer, Kaiser Co., Inc., Portland
Thompson, C. L.	Safety Inspector, Tongue Point Naval Stn., Astoria

NEW YORK:

Baird, M. J.	Safety Consultant, U. S. Employees Comp. Comm., New York City

WASHINGTON:

BREMERTON:

Bruckman, Hubert	Safety Inspector,Puget Sd. Naval Shipyd.,Bremerton
Dewar, Charles L.	Safety Engineer, " " " " "
Fein, Samuel F.	Safety Inspector, " " " " "
Grogan, John M.	Safety Inspector, " " " " "
Hale, R. G.	Safety Inspector, " " " " "
Hazen, Lt. S. W.,Jr.	Safety Officer, " " " " "
Hibbard, R. J.	Master Mech., Sheet Metal Shop, Puget Sound Naval Shipyard, Bremerton
Huffman, Orville	Sr. Safety Inspector, Puget Sd.Naval Shipyd.,Brem.
Ketter, Frank J.	Safety Inspector,Puget Sd. Naval Shipyd.,Bremerton
Koski, Severn M.	Safety Inspector, " " " " "
Marinoni, John A.	Safety Inspector, " " " " "
Mast, T. J.	Sr. Safety Insp., " " " " "
Mawby, Clarence F.	Safety Inspector, " " " " "
Pavlich, George J.	Safety Inspector, " " " " "
Pearrow, Jack	Safety Supervisor, " " " " "
Pierey, A. E.	Safety Inspector, " " " " "
Porter, Robert S.	General Electrician, " " " " "
Renn, Harvey F.	Safety Inspector, " " " " "
Rondeau, James L. Jr.	Sr. Safety Inspr., " " " " "
Rondeau, James C.	Chief Safety Inspr. " " " " "
Schafer, Edward A.	Safety Inspector, " " " " "
Schwab, Leslie D.	Safety Inspector, " " " " "
Simons, W. A.	Chief Safety Insp.. " " " " "
Smith, E. V.	Sr. Safety Inspr., " " " " "
Sucky, Peter	Safety Inspector, " " " " "
Taylor, Albert I.	Foreman, Sheet Metal, " " " " "
Tierney, Harvey P.	Safety Instr., " " " " "
Wojtowski, J.	Safety Engineer, " " " " "
Wessler, Wm. C.	Master Electrician " " " " "
Wilson, Frank L.	Quarterman Pipefitter " " " " "
Zwingar, M. V.	Safety Inspector, " " " " "

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SEATTLE:

(Shipyards)

Cousseau, W. L.	Safety Dir., Puget Sound Bridge & Dredging, Seattle
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DiJulio, Joe L.	Asst. Safety Engr., " " " "
Dull, Wilmer A.	Fire Marshal, Lake Union Drydock & Machine Wks., Seattle
Jordan, C. E.	Safety Director, Todd-Pacific Shipyards, Seattle
McCutcheon, C. W.	Shipwright Foreman, Puget Sd. Bridge & Dredg. Seattle
Sims, Fred D.	Personnel Mgr., Todd-Pacific Shipyards, Seattle
Raftis, E. J.	Safety Supervisor, Todd-Pacific Shipyards, Seattle
Redman, Vic	Safety Engineer, Puget Sd. Bridge & Dredg., Seattle
Shields, Thomas	Safety Director, Todd Shipyards Corp., Seattle Div.
Shilling, Barbara	Nurse, Todd-Pacific Shipyards, Seattle
Smith, Clifford E.	Safety Supervisor, Todd-Pacific Shipyards, Seattle
Servik, Inga	Head Nurse, Todd-Pacific Shipyards, Seattle
Verdick, Joseph A.	Shipwright, Todd-Pacific Shipyards, Seattle
Worsen, Harold E.	Safety Dir., Lake Union Drydock & Mach. Wks., Seattle

(Navy)

Carleton, Lt. E. L.	Dist. Safety Officer, 13th Naval Dist., Seattle
Fellows, John P.	Safety Engineer, 13th Naval Dist., Seattle
Omegland, Harold A.	Safety Engineer, Naval Air Station, Seattle
Hall, Lt.(j.g.) M. W.	Safety Officer, U. S. Naval Air Station, Seattle
Harris, Lt. E.	Asst. Public Wks. Officer, U.S. Naval Air Stn, Seattle
Hayes, J. Harry	Safety Inspector, U. S. Naval Air Stn., Seattle
Hylton, Jack E.	Sr. Safety Insp., Naval Supply Depot, Seattle
Moos, Comdr. A. E.	Dist. Civ. Per. Director, 13th Naval Dist., Seattle
Sorensen, Lt. J. T.	Industrial Relations Officer, Supervisor of Shipbuilding, U. S. Navy, Seattle
Wallin, Capt. E. K.	Supervisor of Shipbuilding, U. S. Navy, Seattle
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(Coast Guard)

Freeman, Lt. Comdr. John C., USCGR(T), U. S. Coast Guard, Seattle	
Wetherby, Comdr. Neil W., U. S. Coast Guard, Seattle	

(Port of Embarkation)

Beck, Captain Frank	c/o Port Fire Marshall, Seattle Port of Embarkation, Seattle
DeMilles, Capt. C. E.	Safety Director, Seattle Port of Embark., Seattle
Fuller, W. E.	Chief Safety Engineer, Seattle Port of Embarkation, Seattle

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Adley, Frank E.	Engineer, State of Wash. Dept. of Health, Seattle
Cameron, Ray	Safety Inspector, State of Wash. Dept. of Labor & Industries, Seattle
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WASHINGTON - continued

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(Miscellaneous)

Anderson, George	Safety & Supply Co., Seattle
Anderson, Vincent	Safety Supervisor, Boeing Aircraft Co., Seattle
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(Except Seattle & Bremerton)

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Brechtel, Hugh	Safety Inspector, Winslow Marine Ry. & Shipbuilding Co., Winslow
George, Capt. William	Safety Officer, Mt. Rainier Ordnance Depot, Tacoma
Gilmore, Robert M.	Safety Engineer, [illegible], Tacoma
Gregory, Morton	Safety Engineer, Mt. Rainier Ordnance Depot, Tacoma
Hughes, T. J.	Safety Engineer, Kaiser Co., Vancouver
Ida, W. G.	Safety Supervisor, Everett Pacific Shipbuilding & Drydock Co., Everett
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Reynolds, Rex	Rigger, Winslow Marine Ry. & S.B. Co., Winslow
Stubbs, Palmer	Training Director, State of Washington Dept. of Labor & Industries, Olympia

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CANADA:

Bacon, Frank C.	Engineering Sls., Taylor Instruments, Vancouver, BC
Klfstrom, M. K.	Industrial Hygiene Engineer, Dominion Govt., Vancouver, B. C.
Francis, Arthur	Chief Inspector, Workmen's Compensation Board, Vancouver, B. C.

(Total registration: 124)

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