

VOLUME 14

1966

NATIONAL SAFETY CONGRESS
TRANSACTIONS

MARINE
SAFETY



NATIONAL SAFETY COUNCIL
425 N. MICHIGAN AVENUE
CHICAGO, ILLINOIS 60611

54th NATIONAL SAFETY CONGRESS

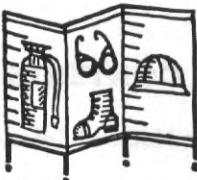
Papers Delivered in the

MARINE SESSION

CONTENTS

Five Years of Future Dates for the National Safety Congress.....	4
STEVEDORING	
DWI Rates — Can We Improve?.....	<i>Capt. J. T. Bishop</i> 5
The V.I.P's.....	<i>Capt. John W. Cain</i> 9
Sense and Nonsense in Longshore Safety.....	<i>Nelson M. Bortz</i> 13
INLAND WATERWAY SAFETY	
Tailoring Known Safety Techniques to Towboat Safety.....	<i>Arvid Tienson</i> 15
Know Your Line.....	<i>Frank J. Haas</i> 17
Measuring the Indirect Costs of Accidents.....	<i>Ralph A. Guffey</i> 20
SHIP OPERATION (Dry Cargo Vessels)	
Environmental Services for Marine Safety.....	<i>Paul H. Kutscheneuter</i> 23
Safety Directly Affects Insurance Costs.....	<i>Walter B. Potts</i> 26
Relation of Cargo Gear to Safety Aboard Ship.....	<i>Capt. E. B. Hendrix</i> 30
COAST GUARD	
Shipping Traffic Safety, Trends and Proposals.....	<i>Capt. W. C. Foster, USCG</i> 33
Portable Tanks for Combustible Liquids.....	<i>Capt. William F. Rea, III, USCG</i> 37
Report on the 1966 Load Lines Conference.....	<i>Capt. Lloyd R. Goddu, Jr. USCG</i> 41
SHIP OPERATION (Tankers)	
Safety Practices in Towing.....	<i>Frank L. Bartak</i> 46
Safe Practices in Loading Petroleum Products in Tank Vessels.....	<i>Philip Neal</i> 49
SHIPBUILDING AND REPAIR	
When Disaster Strikes — An Account of Hurricane Betsy.....	<i>J. R. O'Donnell</i> 54
Address at Joint Luncheon.....	<i>Vice Admiral J. A. Hirschfield, USCG (Ret.)</i> 57
Officers of the Marine Section 1966-67.....	60
Other Volumes in 1966 National Safety Congress Transactions.....	Back Cover

PLAN
NOW TO
ATTEND
THE



1967 NATIONAL SAFETY CONGRESS
OCTOBER 23-26, 1967 / CONRAD HILTON HOTEL, CHICAGO

1968

The Congress is always a big week, a worthwhile week for the 13,000 safety people who attend.

1969

At the '67 Congress you can meet other safety people, with the same problems and responsibilities as yourself. You can exchange views and ideas on accident prevention, health, hygiene, and fire prevention . . . on safety in industry, traffic, school, at home and on the farm.

1970

You can see the largest of all safety equipment exhibits at the Congress . . . an opportunity for you to make well-informed buying decisions for your company.

1971

This four-day educational program, planned and presented by the National Safety Council, can be your most thought-provoking, most worthwhile safety experience in 1967.

Make plans early to attend the 1967 Congress and bring the other people in your organization who have safety responsibilities.

FUTURE CONGRESS DATES	
1967	October 23-26
1968	October 28-31
1969	October 27-30
1970	October 26-29
1971	October 25-28

NATIONAL SAFETY COUNCIL
425 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS 60611

STEVEDORING

DWI RATES — CAN WE IMPROVE?

By CAPT. J. T. BISHOP
Pres. and Gen. Mgr., Portland Stevedoring Co., Portland, Ore.

Although these comments will necessarily refer to many of our own experiences, I believe there will be sufficient matter of general nature which most of you will be able to relate to your own situations.

On the West Coast, each of the four areas has an achievement program, or contest, whereby the stevedoring company with the lowest disabling-injury-frequency rate for a given year is awarded a certificate of recognition. In looking back over a 20-year period (1945 to 1965), our own Company earned nine of these awards — the latest coming in 1960. Since then, our Company's record has been several points above the area average. Therefore, at the present time, we are among the "also rans" with respect to being a safety-award winner. I feel that this position will also tend to slant my remarks toward an average viewpoint with which the majority of you can closely relate your own positions.

The two main items which I would like to present here are:

1. Is management sufficiently concerned and involved in safety matters? and
2. The disabling work-injury rate, and can we improve upon it?

You have all heard from time to time the call for the need of top management to become more deeply involved and concerned with safety matters. In order to give you some idea of our own immediate concern, I feel I should give you a brief description of our situation.

All members of the Operating Department, superintendents and assistant superintendents receive the following directive:

Basic Safety Instructions and Information

"You are required to familiarize yourselves thoroughly with the Federal laws governing longshore safety; and it is your duty to see that our operations, over which you have control, comply with the various requirements of those laws.

"It is your duty to check a vessel's cargo-gear certificate or register in order to determine that it is in force and valid; and, if found otherwise, it is your duty to immediately direct all work suspended and stopped until the situation has been corrected.

"On operations to which you have been assigned, you shall make every effort to visually examine our stevedore working gear, the vessel's cargo gear, and all work surfaces involved in the operation in order to ascertain to the best of your ability that all are in a safe condition to proceed with the projected work.

"When accidents do occur, it is extremely important that proper reports and investigation of the immediate areas, including gear, work surfaces, etc., are made, and that immediate assistance for the injured is supplied.

"You should become thoroughly familiar and efficient with the workings of the instruments supplied you for the purpose of taking carbon monoxide tests where required, and you shall keep records of your findings.

"Although it is important to a stevedoring company to obtain efficient operations and quick dispatch on its jobs, *safety* shall never be sacrificed for production. This will always be the policy of the Company, and must be complied with."

The companies which I am head of are self-insurers. The parent organization has been a self-insurer since 1936; and a little over three years ago, when we acquired our two subsidiary companies, they were also brought into the same program. Under our arrangement, we underwrite all our own injury case costs up to \$12,500 each, with excess over that amount set at various layers up to a maximum \$10 million. This excess cover is provided by outside underwriters.

Therefore, up to the \$12,500 limit, we ourselves are immediately faced with out-of-pocket expenditures for medical treat-

ment, hospital costs, Workmen's Compensation, legal and all other expenses arising from each injury to our employees.

Our company safety program follows this pattern. On all vessel operations, we employ a sufficient number of company superintendents to cover all our jobs, both day and night; these superintendents are charged with the responsibility of our safe performance on the jobs we undertake. Through participation on the employer-employee safety, and management's area accident prevention committees, through company safety meetings and their contacts with the local consultants of the Bureau of Labor Standards and the Pacific Maritime Association's Accident Prevention Bureau, they are kept continuously aware of the entire waterfront safety situation. We supply them with safety materials, and require their thorough knowledge of the Safety and Health Regulations for Longshoring, and the requirements of the P.M.A. Pacific Coast Marine Safety Code, which is a part of our labor contract.

When accidents do occur on our jobs, these superintendents are required to make out reports and follow up with on-the-job investigations of the scene, gear and all other conditions which may have a bearing on the case. Each occurrence is immediately reported to the operating manager and all other parties concerned. In all areas worked, the companies have arrangements with competent physicians, clinics, hospitals and ambulance services which supply immediate and complete medical service to our injured.

Our own Workmen's Compensation attorneys are in turn charged with following through with further and more thorough investigations, such as visiting and interviewing the injured and any witnesses, obtaining depositions, handling compensation matters with the labor commissioner, and carrying through with all legal aspects of each case.

Adequate files and charts are kept on a running basis covering all injury reports whether or not they become compensable cases. All the material is made immediately available to myself, and we continuously scrutinize our position in relation to all phases of every case.

Since the great majority of our accident and injury cases fall within the maximum

limit (\$12,500), we are at all times fully aware of the need to prevent and avoid injuries, since, in our position, we are immediately hit in that location which hurts very much — our pocketbook.

With an expenditure exceeding \$500,000 a year, covering the various phases of our injury experiences, in our case, the need to carry on safe operations and prevent injuries is a matter of immediate and serious concern.

Though there are a number of instances to which I could refer that would show our direct and active efforts in safe operations, I would particularly like to cite just one. In the Columbia River area, we handle approximately 500,000 tons of inbound bulk cargoes per year. These cargoes, mainly ores and salt, are discharged by crane, with the use of bulldozers and payloaders in the vessels' holds to move the cargo to the squares of hatches. In addition to bulk-carrier vessels, a considerable amount of these cargoes are carried in conventional tween-deck vessels, with many instances of deep-tank stowage.

For years, we had been using gas- or diesel-powered equipment on this operation. The use of such machines obviously posed serious carbon monoxide problems, requiring our rigging a considerable amount of ventilating equipment, also requiring us to continuously obtain readings of carbon monoxide contents in the atmosphere of the areas being worked. In spite of all our precautions, we were plagued with a continuing and growing number of complaints from the drivers and men required to work in the holds. During foggy and misty weather, when conditions of air inversion existed, we found that the use of additional blower equipment would not solve the problem of continuously keeping the atmosphere at a safe level, requiring us to shut down the jobs until such time as conditions improved.

Faced with this very serious situation, the stevedoring companies made many studies of the feasibility of changes in the equipment being used. A number of ideas were implemented — some of these being the use of catalytic type mufflers; and a so-called "snorkel" exhaust made of flexible tubing, which extended from the machine to above the main-deck coaming. None of these measures proved to be completely and economi-

cally successful in obtaining the desired results.

Finally, with the cooperation of a local enterprise, we came up with a solution; removing the gas and diesel engines and replacing them with 30-h.p., 440-volt, electric motors, which obtain power directly from the dock. For guiding and clearing the power line, a system of fair leads, leading from the dock plug to the coamings, and thence to a tension reel mounted on the machine, was installed. After some experimenting and minor changes, we eventually came up with what has proven to be an extremely satisfactory solution to what had been a serious safety problem.

Throughout the industry, wide interest has been expressed about this type of equipment. The local enterprises making these changes are presently preparing the same kind of equipment for other bulk operations both in the Puget Sound and in the San Francisco Bay area.

The success of this move has in turn generated other ideas. We are presently experimenting with the same type of change on pneumatic-tired lift trucks for use where machines are required in vessels' holds to handle palletized or unitized cargoes. If this proves successful, we have ideas for further usage of such equipment on terminal and dock operations when confined to limited areas, such as in boarding and palletizing cargo.

This particular example is, in my opinion, just one instance of management's concern and direct participation in safety.

I now come to the second subject of my paper — The disabling work-injury rate, and can we improve upon it?

We know that the industry's relatively high, and nearly stable, lost-time-injury rate continues to be a matter of most serious concern.

In recent years, we have noted many advances, such as the required valid vessel cargo-gear certificates, the certification of stevedore gear and equipment, great improvement in operational housekeeping, a sharp improvement in means of access — such as gangways and ladders, good control of atmospheric conditions on operations using machines, and other items.

Despite these many gains, no appreciable decrease in the lost-time rate has resulted.

Seeking clues to reasons for our own apparent failure to improve upon the record, and noting the similarity of our own Company's experience with that of the area, we enlisted all of our local L.S.B. consultant, and made an analysis of our own situation.

For the first six months of 1966, we experienced, and were charged for, 30 lost-time injuries, none of which were due to failure of either vessel's or stevedore's gear and equipment; only two of these cases were attributable to unsafe conditions—one slipped on oily deck and one stepped in hole in stowage.

Using our own rating procedure, we classified 10 cases as *slight or minor* (these were cases involving one to seven days lost time), 10 cases as *moderate* (involving seven days to two weeks lost time), and 10 cases as *severe* (involving two weeks and more lost time).

In the first group rated "slight or minor," we found, in several instances, that some possibility existed whether they could, with greater attention on our own part, have been eliminated as DWI's. We found that when the individuals in these cases reported to the out-patient clinic for treatment, the physician had indicated they should return for further examination in a few days or a week. He had failed to specifically direct them to return to work; and these men had assumed, or possibly considered, the order to return for examination as an "invitation" to take time off. By coincidence, these cases occurred during our Spring salmon run when the fishing was exceptionally good. We were certain these men could have, after treatment, returned to their jobs without any resulting danger of complications. Perhaps this is our problem to handle with our doctors.

In the second group, rated "moderate," all the cases were the result of unsafe acts — these being missteps, tripping, bumping into objects, two being self inflicted by mishandling of tools.

In the third group, rated "severe," only two were attributable to the previously mentioned unsafe conditions; the others occurred while pushing, pulling and lifting; six of the ten resulted in back injuries — in three of which we found a pre-employment history of back trouble.

In the 30 injuries, several were due to lack of coordination or teamwork in the gang unit, such as inopportune actions of winch drivers or a working partner's unsafe act.

Our records show that, in the small ports of our area, as opposed to the relatively large central port of Portland, the injury frequency rate is consistently lower; the apparent reason for this condition lies in the fact that in those areas there is greater stability within the work force, resulting in better teamwork in the gang unit. We noted too the higher ratio of injuries to so-called "permit" workers as opposed to fully registered men having greater experience.

Upon completion of our study, we compared our own experience with that of all other stevedore employers in our area, and the similarity was strikingly evident.

Feeding as we do, that our own and our area's situation reveals conditions that are reflected generally throughout the stevedoring industry, in order to make any appreciable gain in the relatively poor lost-time frequencies, certain needs become obvious.

The hazards of our industry will remain generally constant — these being the type of work and procedures common to all stevedores.

The causes leading to accidents will also be similarly present — these being unsafe conditions, and particularly the unsafe acts of our men.

There is no doubt that the implementation of the B.L.S. Safety & Health Regulations, and the requirements of the various safety codes which apply to our industry have brought great improvements in control of unsafe conditions; however, from the record, these measures alone have not brought any substantial decrease in our lost-time injury experience.

If such is the case, we should recognize the fact that a serious need exists for a greater degree of correction of the unsafe

acts of our men, the cause of the most accidents. Unsafe acts, attitudes and work habits of the men must be bettered to further reduce accidents.

In my opinion, the route to success in this field lies within the reach of the leadership of management and labor, both of whom repeatedly profess concern with the situation, but both of whom I consider to have shown a sad lack of effort in getting the job done.

While not advocating any evasion of the employers' responsibilities, or any invasion of labor's rights, if our own and our area's experience can be judged as a criteria of the over-all situation within the industry, certain basic requirements, presently lacking, are indicated. These are:

1. An improved system of the presently perfunctory physical examinations, aimed towards providing men fit for the type of work intended. (A start in this direction has been made on the West Coast.)
2. A safety indoctrination program for new men entering the industry, stressing their recognition of and attention to the many inherent hazards that exist.
3. A continuing program of education and re-education, both in safety and in skill training, aimed towards maintaining a safe-working and efficient work force to meet changing techniques and conditions.
4. A more safety-conscious attitude and safe-practice performance must be the approach of both management and labor.

I believe these items are the fundamentals with which we, as an industry, could truly improve on our record, and I further believe that in view of the great degree of mutual self-interest of both labor and management in the matter of safety, a base for agreement and action exists.

The target is clearly defined, and our course must be directed toward getting the job done.

THE V. I. P.'s

By CAPT. JOHN W. CAIN

Mgr. Galveston Operations Atlantic & Gulf Stevedores, Inc., Galveston, Tex.

I would like to begin my discussion by stating a mathematical formula that has been proven true all through the history of accident prevention work:

$$H + P = A$$

Or stated more completely, Hazards plus People equal Accidents. Remove either the hazards or the people and we will not have accidents. It is a foregone conclusion that we cannot eliminate people and still load and unload ships. But it has been proven that we can remove or reduce a high percentage of the hazards *through people* and thereby greatly reduce human suffering caused by accidents and improve our overall job efficiency.

Let me state again that accident reduction is accomplished *through people*. This starts with top management and goes all the way down the line to the longshoreman working in the hold of the ship. In other words everyone connected with loading and unloading a ship is a V.I.P. when it comes to safety.

Top management people are Very Important Persons when they set strong and active company safety policy and follow up on this policy. *Line Supervisors* (such as ship superintendents and walking foremen) are Very Important Persons when they implement the safety policies of the companies. *Longshoremen* are Very Important Persons when they perform their work in a safe workmanlike manner. *Union Leaders* are Very Important Persons when they train and instruct their membership in safe work practices and methods.

So you can see that everyone in our industry is a V.I.P. when it comes to accident prevention.

Who is affected by accidents?

First of all the injured man is affected because he may experience pain and suffering, loss of wages, loss of occupation (in the case of serious injury), and suffering by his family.

Second the company is affected due to immediate loss of or decreased production,

time lost by employees, time lost by supervisors, damaged equipment, spoilage of cargo, increased insurance costs, etc.

Third is the effect of accidents on the community. Labor once lost is never recoverable. The cost of accidents eventually comes out of the pockets of the public either in taxes or in increased prices of goods.

It appears on the surface that accidents are caused by a combination of circumstances and events that are endless in variety. However, the causes of accidents can be boiled down to three major categories.

Accidents are caused by:

1. Unsafe Conditions such as:

- Inadequate mechanical guarding.
- Defective condition of equipment.
- Unsafe design or construction.
- Hazardous processes, operation, or arrangement.
- Inadequate or incorrect ventilation.
- Inadequate or incorrect illumination.
- Unsafe dress or apparel.

2. Unsafe Acts such as:

- Working unsafely.
- Removing safety devices or altering their operation.
- Operating at unsafe speeds.
- Use of unsafe or improper equipment.
- Horseplay, teasing, abusing, etc.
- Failure to use safe attire or personal protective devices.

3. Contributing Factors such as:

- Man's age.
- Man's physical condition.
- Man's experience at work.
- Man's training.
- Etc.

I'm sure you can think of many examples of these causes that occur in our industry.

So we have seen that accidents are caused by unsafe conditions, unsafe acts, or con-

tributing factors. Many times it is a combination of these.

The National Safety Council has used a slogan for several years now entitled, "*What is past is prologue*". This means that a large part of our current accident problem is just repetition of the same causes. It is hard to dispute the facts developed by an accident analysis because each accident represents either pain and suffering or an economic loss. To illustrate how the V.I.P.'s can reduce accidents a recent study of 57 major injuries to longshoremen has been completed. I say *major* injuries because these represent accidents where longshoremen were *seriously injured* in my home Port of Galveston. (Fortunately, there were no deaths). Each of the injuries cost over \$2,000.

37% or 21 of these 57 injuries occurred when longshoremen were *struck by objects*.

37% or 21 of these 57 injuries occurred when longshoremen *slipped or fell* at the same or different level.

14% or 8 of these 57 injuries occurred when longshoremen were *caught between objects*.

11% or 6 of these 57 injuries occurred when longshoremen *strained themselves*.

The other accident involved a costly eye injury.

An age old principle is again proven here—that is—most serious injuries can be prevented if you can keep men from falling or something from falling on them. As we look at each of these 5 groups and discuss briefly a few of the serious accidents, try individually to see how you as a V.I.P. where accident prevention is concerned could have helped to prevent this injury. We all know that there are three ways to prevent injuries :

1. Eliminate the hazard.
2. Guard against the hazard.
3. Reduce the hazard.

Longshoremen Struck By Object

Of the 21 serious accidents in this group, 12 occurred when longshoremen were struck by *falling cargo* and 9 occurred from being struck by *other objects*.

Could the hazards that caused these 21 accidents have been reduced by the V.I.P.'s?

Let's look at some of these serious accidents.

The Accident:

Hatch board fell from T.D. when trimming machine hit beam, hatch boards hit longshoreman on back.

Bags of flour fell from draft and hit man on back, injuring head and shoulder.

Bales of cotton fell apart from a poorly slung load and hit man on back.

The hazards here could have been reduced by:

Removing all hatch boards adjacent to trimmers.

Providing safety nets on pallet bridles.

Taking a safe position instead of an unsafe position.

Spreading the cotton slings.

Providing cotton landing templates that insure automatic safe sling spread.

Alerting the men in the hold.

Remember these are actual serious injuries to longshoremen that I am discussing and the hazards could have been reduced by the V.I.P.'s of safety.

Longshoremen Slipped or Fell

Of the 21 serious accidents in this group, 18 occurred when longshoremen fell at the *same level* and 3 occurred when longshoremen fell to *different levels*.

Let's look at some of these types of accidents:

The Accident:

Longshoreman slipped on grease between winches and injured hip.

Hatch board broke and man fell injuring knee.

Man fell into lower hold from upper tween deck while passing out boards and badly bruised his body. (He is lucky to be alive.)

Man fell off cotton table when hook pulled out of bale.

These hazards could have been reduced by:

Improving our housekeeping.

Providing good hatch boards or covering poor ones.

Allowing at least a three foot clearance in the tween deck at all times.

Providing safety nets adjacent to drop-offs.

Longshoreman Caught Between Objects

Of this group, 8 longshoremen were seriously injured.

Typical accidents in this group include:

Man caught foot in V-belt drive of belt conveyor.

Man caught between bulwark and deck cargo while stowing cargo on deck.

Caught hand between pontoon and coaming while covering up.

I am sure that you can see how these accidents could have been prevented by proper guarding in the case of the V-belt and through *individual action* and *team work* concerning the others.

Longshoreman Strained Himself

There were 6 serious injuries in this group.

Typical accidents were:

Man strained his back stowing cotton.

Man strained his back lifting boxes.

Our hazards here again can be reduced by *team work* and *individual action*. Perhaps shifting the feet instead of twisting the back, using the leg muscles instead of the back when lifting, etc.

Gentlemen, by *team work* between all of the V.I.P.s of safety, we can help to take our industry off the bottom of the accident frequency list and help build a safer place for us and our next generation to work.

I challenge all V.I.P.s of safety to take a *more active* part in accident prevention activities at all levels in our industry. I submit that the following is needed concerning *management V.I.P.s* and *labor V.I.P.s*:

Management:

1. Management needs to set accident prevention policy and follow up on their policies.

2. Management needs to communicate more closely with their own line supervisors to let them know that the company is interested in accident prevention and that line supervisors are to be held responsible for implementing company safety policy.

3. Management needs to offer training and education in accident prevention to their

line supervisors. Supervisor Safety Meetings once per month and led by top management is a good opportunity to communicate safety policy, follow up on the policy, and offer accident prevention training and education. Insurance companies, private safety consultants, and the government offer assistance in training and educating with regard to accident prevention. A word of warning to top management—let these be *your* meetings. Do not depend too heavily on some one else. The responsibility is *yours*.

4. Management needs to keep better accident records. Not just government records because you are required to, but records that are meaningful to *you*, such as:

Analysis of accidents by ship, Line, Superintendent, Walking Foreman, Gang Foreman, Union, etc.

Analysis of accidents showing type, agency involved, part of body injured, etc.

Management doesn't have to keep all of these analyses, but determine the type of analysis that can best benefit *your* organization.

Also needed in each port is a central accident report gathering location sponsored by the maritime industry of that port. All companies could report injury records to this central location. If records indicate a certain individual is involved in a large number of injuries and is not physically or mentally fit for longshore work, this information could be taken up with labor.

This is an activity that could not be accomplished by a single stevedoring company, but would require port wide cooperation. Labor's cooperation would be of prime importance.

5. Management needs to actively work with industry safety groups and projects (such as the group here today) to work toward making our industry safer. There is much accident prevention work that we as an industry must do on a *voluntary* basis.

6. Management needs to insist on accident investigation by line supervisors. Not to place blame, but to find out how similar accidents can be prevented. Also, accident investigation has these advantages:

Immediate steps to eliminate or reduce the hazards can be taken because of the knowledge gained from the investigation.

By seeing first hand the causes of accidents, the supervisor will usually teach others what he has learned.

Accident investigation teaches supervisors how to observe conditions and practices with a questioning attitude of "Could an accident happen here? How?"

To be effective, these accident investigations by line supervisors should be sent to the attention of top management. Many of you will probably say that supervisors have enough paper work already, but remember—we gain valuable knowledge from our past experiences.

Now let's discuss what is needed of labor accident prevention V.I.P.s.

Labor

1. Union officials should open their doors to accident prevention training and education classes. Plenty of assistance is available from their own people, industry safety groups, insurance companies, and the government. It is an accepted fact that employees must be trained from the time they begin a job until the day they retire from a job. None of us ever get enough training. Since the beginning of the shipping industry, our jobs have been undergoing a change until today we have very few jobs which do not require some special skill.

2. Unions need to keep accident records also. Some unions are doing this and actu-

ally taking disciplinary action where need is indicated. These records could also guide planning for safety training. Records may indicate that there are certain problem areas where men need more training.

3. Unions need to have mandatory safety indoctrination courses for all *new men*. This is presently being done on the West Coast. Class B men are *required* to take 12 hours of classroom instruction in accident prevention before they can be promoted to Class A.

4. Labor needs to incorporate safety sessions at their conventions. Here again, many safety specialists are available to assist in this effort.

5. Labor needs to take a realistic look at their senior members and retire those with physical conditions that expose others to hazards.

Gentlemen, let me close by illustrating a point. We all know that $3 \times 3 \times 3 = 27$. However, if we make only one small change—change one of the 3s to a 4, we greatly change the overall result. That is— $4 \times 3 \times 3 = 36$.

The same thing is true in accident prevention work. Some small change to increase our accident prevention efforts may not seem immediately significant to us as an individual, but when we look at our overall accident prevention efforts, it may greatly change the end results.

SENSE AND NONSENSE IN LONGSHORE SAFETY

By NELSON M. BORTZ

Director, Bureau of Labor Standards, Washington, D. C.

1. It is nonsense to assume that the frequency rate for shipboard longshore operations would have declined more than 30 per cent since enactment of the Longshore Safety Act in 1958 without the Federal regulations under which this progress has been achieved.

2. It is equally nonsensical for me to declare that we in the Bureau of Labor Standards brought about these gains singlehandedly. We didn't. It is sensible to attribute this progress to individual companies, efforts of port associations, a growing cooperation on the part of the unions, and to the training, consultation, inspection services—and enforcement provided by the Bureau of Labor Standards.

3. It is nonsense to say that we have hit bottom—that further frequency rates reductions can't be made. It makes sense to observe that longshoring, as a high incidence industry, still has a long way to go. Personally, I think we have another 50 per cent reduction to make before we should strain our arms to slap our backs in satisfaction.

4. It is nonsense to believe that the regulations presently in effect will remain static, or cannot be improved upon to the benefit of both employer and employee. It makes sense for all interested parties to assist us in identifying areas which might be strengthened or clarified. As for our own approach, we shall continue to test the effectiveness of our regulations in the light of experience, changing conditions, compliance, and need.

5. It also doesn't make sense to assume that chronic offenders of our safety regulations have or will escape unscathed. We have taken action as circumstances dictated. We have also this past year amended our regulations to provide for the lifting of a cease-and-desist order when substantial, consistent improvement in compliance is demonstrated. This concept, I believe, demonstrates our desire to be both stern and fair.

6. It is nonsense to take the view—whether by conviction or cowardice—that "there ought to be a nation-wide government regulation" to solve all of your safety

problems. Certainly there are many matters—safety shoes, work practices, fatigue, physical examinations—where the initiative—and hopefully the resolution—should rest with the parties directly involved and not Washington.

7. It is nonsense to think that in operations as hazardous as are here involved, the only governmental regulation should apply aboard a vessel. It makes sense to see to it dockside work is also covered and that all parties concerned get on with the business of completing the dockside safety standards (MH-9) and help get its adoption in the states.

8. It is nonsense to think of the LSB safety officer as a gumshoe sleuth out to ticket you. This isn't so. It makes sense to regard him as a constructive consultant, more anxious to point out hazards and safety program control measures and help you correct them. It takes two and often three, however, to make this procedure effective.

9. It is nonsense to oppose safety standards on the allegation that they unfairly use the stevedore to enforce regulations on matters which are basically under the control of the vessel. There are legal limitations on the Bureau's authority and some practical limitations on the stevedore, but our observations have been that many stevedores do not use this line of reasoning. Instead, they have sought, not only to comply with the regulations, but also gain acceptance by the vessel of its responsibility for correcting unsafe conditions—and without harm to the stevedore's competitive position.

A number of port associations—Baltimore, Norfolk, several Florida ports, and others—have prepared and distributed brochures to arriving vessels, requesting their cooperation, pointing to specific regulations such as gangways, cargo gear, hatch coverings, stowage, dunnage, in which their help is needed.

10. It is nonsense for some of the industry to be stiff-legged and standoffish in seeking union cooperation. It is equally non-

sensical for union people to use safety as a ploy for some other gambit. It makes sense on both sides to make safety a joint affair free from petty politics, outmoded prejudices, and a desire to score a point.

11. It is nonsense to declare you can't change a longshoreman's attitude. This may be so in some cases but it makes sense to try rather than to use this as an excuse for doing nothing or attempting to shift responsibility.

12. It is nonsense to assume you will get a good safety program, reduce your compensation cost and cargo damage without involving top management, providing supervisory controls, and setting up employee training and employee safety programs.

13. It is nonsense to take the attitude that gasoline powered hi-lo's or lift trucks in the hold or deep tanks don't require regular and periodic testing for carbon monoxide (CO), or that a record of your tests isn't necessary. It is. It is also sensible to search out better ways of handling cargo in these difficult to ventilate spaces, since this is a serious hazard that must be eliminated.

14. In the same vein, it is nonsense to ignore the possible hazards of handling unknown chemical cargoes without taking suitable precautionary measures. It makes sense for all of us to insist upon the better label-

ing or manifesting of potentially dangerous chemicals and for employers to be familiar with emergency measures and to have proper protective clothing and devices handy at all times.

15. It is nonsense to proceed on the belief that an increased use of containers will automatically eliminate injuries to longshoremen by doing away with manual handling of cargo. It is sensible to expect this type of operation will eliminate a number of hazards. It is also sensible to be on guard against the introduction of new or different problems which may relate to overloading, unstable loads, poor design, deterioration or lack of maintenance. These are aspects of our changing transportation technology that I am sure both stevedores and steamship companies wish to study and avoid.

Now, in conclusion, I would not want to leave you unduly downcast or disturbed. Progress has been made. Despite the heavier workload pressures of the past year, the record—at least through the first 6 months of this year—is heartening. Overall, your national longshore frequency rate is down to 84; I hope we can hold it and continue to improve it. It won't be easy and will take extra efforts.

We are grateful for your cooperation and appreciate your interest, understanding, and actions on behalf of a safer operation.

INLAND WATERWAY SAFETY

TAILORING KNOWN SAFETY TECHNIQUES TO TOWBOAT SAFETY

By ARVID TIENSON

Director of Insurance and Safety, Material Service Division,
General Dynamics Corp., Lyons, Illinois

I do not subscribe to safety generalities, banalities, and slogans. Nor do I wish to blame employees for being careless, stupid or ignorant. If we are to get maximum results for our safety efforts, we must measure and use known safety techniques to fit our towboat safety program. Since we all have limited funds it is important to concentrate our safety dollar in those areas in which it will give us the greatest return in the prevention of accidents and "Jones Act" cases.

There are many unique aspects to a towboat operation. I believe it would be well to start taking measurements of some of these aspects and see what material, what safety techniques, what approach might be most effective.

Employment

The Inland Waterways barge line operators, through the Union Hiring Hall, tradition, and intermittent layups, interchange employees more than any other industry I am aware of. This fact and the "Jones Act" emphasize the need for a common approach and a common pool of knowledge in regard to our employees. We have found that the following has proved valuable in preventing injuries and/or Jones Act cases;

(1) a pre-employment physical examination which includes a good medical history so that accident- or claim-prone individuals can be screened;

(2) the individual should be fit for *heavy* work.

Galley personnel should have blood checks.

All pilots should have good distance visual acuity with adequate depth perception. We have used our own eye testing equipment for checking distance vision on a three-year basis. For pilots, mates and engineers we have arranged for a yearly physical check-up. We believe it pays off.

We have also found that the Marine Index Bureau does provide a useful service in determining employee background.

A free exchange of information between barge lines on prospective employees is not only useful but perhaps essential. Care should be taken not to discriminate against any individual.

Personal Protective Equipment

The one essential piece of protective equipment that there can be no equivocation about is the "life jacket"—100 per cent of the time on, to and from the tow. I recall that we had a drowning many years ago in which a deckhand on his way to the head of the tow slipped and went into the ship canal. His body was found a day and a half later. This man had intended to use the life jacket of the man he was relieving. Use of a life jacket 100 per cent of the time would have saved this man.

Foot protection I would say is next on the list, particularly for handling rigging. Again no substitute for 100 per cent of the time when on duty. Eye protection and eye correction are essential—remember, the pilot. We have found it good business to provide safety glasses ground to prescription for our regular employees. Here's a pair of glasses that saved at least one eye. A steel cable snapped and hit the deckhand across the eyes. The results of this one occurrence has paid for our eye-protection program.

First Aid

Emergency first aid, while critical in all industries, is emphasized in importance on a tow. It is not at all unusual to be at least an hour and more or even a half-day away from professional assistance. The following check list of things to do and have, I believe, is useful:

Have an adequate first aid industrial kit

with supplies kept up and in a sanitary condition.

We have found the inflatable type plastic splints superior in use.

A stretcher, a small portable oxygen tank (medical) are also desirable.

Have at hand the names, locations and phone numbers of people to call in case of emergency. Know at what mile what sources of help are to be called.

Lastly, if at all possible, someone regularly on board should have first aid training. On shore there should be a coordinated procedure to provide any necessary emergency assistance to the tow in case of a serious injury or accident.

Investigate accidents promptly and thoroughly. Accidents that involve real or alleged injury, call for immediate action. All facts that may have a bearing on the incident should be ascertained and accurately recorded. Signed statements by witnesses and anyone having knowledge of the accident should be taken. Frequently photos taken by a professional photographer are in order. An accident report giving all particulars should be made up by a trained observer if possible. If a hazardous condition exists that may have contributed to the accident, correct it at once.

Fire Protection

Fire, always dangerous, can be catastrophic on a tow. We see this common denominator of "exaggeration" for barge lines in "costs of injuries," "increased employment problems," providing first aid, and now fire. The need of the tailor-made program becomes ever clearer.

The provision of an adequate and proper type of portable fire extinguisher goes without saying. What we must be sure of, however, is that all boat personnel are aware of their location. The fire extinguisher locations must be clearly marked and readily accessible. A periodic check or inspection should be made, preferably on a monthly basis, to see that all extinguishers are in proper working order and have unbroken seals.

We have provided all of our boats with a piped CO₂ system capable of handling the entire bilge. We feel this is real cheap insurance. Also we have fog nozzles for our fire hoses.

A station bill with periodic fire drills is

a coast guard regulation. An efficient and effective fire fighting procedure is fine and necessary, but, really, why have fires?

Good housekeeping is absolutely essential. Excessive accumulations of oil, grease around machinery, grease in the galley, open paint cans, improper containers for solvents, etc., are fuel for a fire. Do not let them accumulate. Minimize fuel by using fire resistant or retardant materials on board wherever possible. Fire retardant paint is a fine example. Dispose of accumulated waste materials in a safe sanitary manner, being careful not to throw anything into the river. This is against the law.

Be wary, for instance, of disposal type toilets (electric). We wound up with a few "hot seats." Smoking in bed can be dangerous. Have disposal units for cigarette butts.

Containers for gasoline, oil, cleaning solvent must be of an approved type, properly labeled and stored. Portable gasoline driven pumps or light plants need to be in good repair. They too can leak fuel and present a fire hazard.

Remember that since you most frequently must be self-sufficient or alone in handling a fire, avoid the fight and/or be on the ready.

Safety

The Inland Waterways Health and Safety Committee has developed statistics on accidents and types from the records of a number of barge lines. Emphasis and frequency is in the handling of rigging, slips and falls. Anything you can do to prevent slips and falls by the use of anti-skid steps, plates or paint is money well spent. See that your rigging is in good repair and inspected frequently. Are your mates and in turn your deckhands familiar with the proper ways to carry, use and store rigging? These are the big, the frequency producing potential hazards. What else happens on a tow?

Comparison of Special Accidents* to Total Accidents by Year and to Four Year Totals

Year	Total Acc.	Spec. Acc.	% of Total Acc.	% of Total Cost
1962	25	12	48%	23%
1963	16	6	37%	62%
1964	14	3	21%	5%
1965	15	4	33%	10%
Total	70	25	36%	27%

* Special Accidents are those which result from the *unusual* hazards instead of those hazards which are usual to the marine industry.

In summation, we have as an industry, the highest cost for similar injuries, the greatest interchange of employees, the most difficult first aid treatment problem, our fire hazard potential is exaggerated, and

so on down the line. We sincerely believe a tailor-made safety program, using approaches we have discussed, and strong support from top management works. It has for us.

KNOW YOUR LINE

By FRANK J. HAAS

Field Engineer, Plymouth Cordage Div., Columbian Rope Co., Auburn, N. Y.

Rope is probably the most important tension member on board a ship, tug, or barge. Many times a man's life depends on a line. A line may prevent an accident, and management expects a line to do its part in carrying out the operation of its business.

Previous to 15 years ago all lines aboard ships were made of natural fibres, the most common of which was manila. This was a general purpose rope that was used in practically all applications. With the introduction of synthetic ropes these conditions changed. It was soon found that each synthetic rope had its own peculiar characteristics and in many cases could only be used for a specific job.

Nylon in those days had about twice the strength of manila and was some 15 to 20 per cent lighter than manila. It was soon found that nylon had a very high elongation and elasticity and could not be used for close work because of this stretch. Its big advantage seemed to be in ocean towing where because of its great elasticity it had a very high impact resistance. This meant that it could absorb shocks without parting.

Dacron than entered the picture a few years later. Dacron is probably the best all around synthetic fibre for cordage. Its characteristics are the closest to manila than any of the other synthetics. However, due to its relatively high cost and weight it was not accepted readily. Dacron does not stretch as much as nylon and, at the lower percentages of its tensile strength, it has less stretch than manila. It is not elastic, in other words, when Dacron is stretched out it doesn't return to its original length as does Nylon. Because of this property it is excellent for close work, for example alongside towing.

Next came polyethylene. This filament is very light. It has a specific gravity of

.95 and will float. However, because of the extreme slippery surface it was quite difficult to handle.

Polypropylene then entered the picture. The use of polypropylene was aided by the oil companies because this polymer was made from their product. Polypropylene has a higher co-efficient than polyethylene, consequently, it was easier to grab and handle than the polyethylene. Its strength is about one and a half times that of manila and weighs only two-thirds as much.

But here, too, developed a problem. All the polyolefines, that is both polyethylene and polypropylene, have a comparatively low melting point, namely, 240° for polyethylene and 330° for polypropylene. When this line was used as a working line, it was found that the polypropylene would actually melt when a strain was applied to the line and it would "stick" to the bitt or cleat that it was attached to. This meant that its use would be probably be confined chiefly to mooring lines or other applications where heat would not be generated.

It was while investigating one of the complaints of polypropylene sticking that it occurred to me that if we could combine the higher melting point Dacron with the light polypropylene we may have a line that would be a good general purpose rope and be a cheap substitute for Dacron. I set out designing this line about eight or nine years ago and tested several variations and combinations of construction and fibres.

After all tests were concluded, our Duo-Syn which is a combination of Dacron and polypropylene gave the best results. In this construction, the outer yarns in each strand were made up of polypropylene filaments covered by Dacron, then the entire inside of the rope was polypropylene. In this way any external contact the rope would have

would be against the Dacron and any abrasion action between strands would be Dacron on Dacron. This combination proved very successful. After the Duo-Syn line has been in service for a short period of time the Dacron fuzzes on the surface giving it a rough feel. This makes for better gripping qualities and an insulation between the polypropylene and an external surface.

Recently we have developed our P/D Mark 100 which uses a larger percentage of Dacron on the cover over polyethylene fibres. We have found over the years that polyethylene seems to be a little bit more compatible with Dacron than does polypropylene. These P/D Mark 100 lines have proven very satisfactory in actual use.

Our technicians in Auburn are still experimenting with new fibres and variations in the present available materials. For instance, we have a few lines being tested with expanded polypropylene and with yarns made from polypropylene film. Both of these show some promise of improvement over the plain extruded filament.

About six or seven years ago, the Columbian Rope Company introduced plaited rope into this country. It had been used quite extensively by foreign manufacturers but the United States was quite slow in accepting its advantages over the conventional 3 strand construction. Plaited rope is made from 8 strands combined in such a way that there are two pairs of left hand strands turning to the right and two pairs of right turn strands turning to the left. This construction eliminated the old problem of rope hocking when used on a winch or gypsy head. Having the turns in the rope neutralized, the rope does not have a tendency to turn when a force is applied to it nor in the case of synthetics where a free end is involved such as lifting an object with a crane the turn will not run out of the rope and cause a hockle when the strain is released.

Plaited rope is not a general purpose line, its use is chiefly where hocking is a problem in 3 strand rope. There are several shipping companies using it for mooring lines where the lines are fed out through chocks on the port or starboard side of a ship and controlled by a common two capstan winch. One side will take turn out of the line, the other side will put turn in. As long as the deckhand is conscientious

and reverses the lines periodically, the three strand rope will do a satisfactory job. However, this is not always the case nor is it convenient to do so after a period of time, we find that one line is full of kinks and the other side is full of hockles and soon has to be discarded.

We recommended a safe working load for the different types of rope. This safe working load is the tensile strength of the rope divided by the factor of safety. The recommended working load for manila is 20 per cent of the tensile strength. Nylon — 11 per cent; Dacron — 11 per cent; Polypropylene — 17 per cent and the composite ropes—17 per cent. This difference in the factor of safety is to prevent users from substituting synthetic ropes for manila on strictly a strength basis. We have found over the years that if synthetics are substituted for manila on strictly a strength basis using factor of safety of 5 for both, that the synthetic ropes will not give satisfactory service.

As an example, suppose a ship is using 8 inch manila for some application and decides to switch over to nylon. Eight inch manila has a breaking strength of 52,000 lbs. If one goes to 4½ inch Nylon having a breaking strength of 56,500 lbs.—he is cutting his size almost in half. Now any slight amount of chafing on the 4½ inch line would be more detrimental to the surface of this line than the same amount of chafing on the 8 inch manila. For this reason chiefly, we would recommend the 6 inch Nylon to do the work of an 8 inch manila, even though its strength is nearly double that of manila.

There are several suggestions that we recommend for the safe use and proper care of synthetic ropes.

1. Bending radius for all lines whether natural or synthetic should be not less than four times the diameter of the rope. This applies to chocks, bits, and sheaves. Using a smaller radius over a long period will crack the fibres and loss of strength will result.

2. Friction causes more failures in working lines than any other. Heat generated by friction will often be great enough to melt or fuse polyolefin filaments, causing a skin on the rope surface. This condition can be dangerous, as the line often sticks to the metal surface then suddenly gives away.

Nylon and Dacron must also be handled with care, especially on moving flat capstans and rendering on bitts. With new synthetics use at least six full turns on a capstan. As the rope wears in, the turns can be gradually decreased. Keep slippage of line on the capstan at a minimum.

3. Abrasion resistance is usually a factor of the hardness of the rope used, in both natural and synthetic fibres. The hard lay rope will stand up better in use, however, some of the ease of handling and splicing characteristics must be sacrificed. Manufacturers' medium lay will usually give satisfactory service, in extreme cases where abrasion cannot be avoided, a hard or extra hard lay should be used.

4. Impact resistance or energy absorption. Nylon because of its great elasticity far excels all other materials in this characteristic. Assuming manila is one, Nylon would be 8.6, Dacron 4.0, Polypropylene 5.2. This high energy absorption quality can be dangerous. When a synthetic line reaches its elastic limit and parts, it will "snap back" and sometimes cause serious damage and personal injury. Avoid standing in direct line of pull.

5. Mildew and Rot. Natural fibres are weakened by mildew and rot. There have been several treatments impregnated in ropes during their manufacture. Most of them are copper compounds and have proven very satisfactory as long as they last, however, they all wash out in water after prolonged use and is very difficult to replace the treatments. Synthetic ropes do not rot and the mildew that attaches itself to them is not detrimental.

6. Lubrication. All ropes whether natural or synthetic are lubricated in the manufacturing process. Do not attempt to add lubrication as you will in all probability do more harm than good.

7. Splicing. Synthetics are spliced in the same manner as manila except use at least four full tucks instead of three. It is often advisable to add two-thirds and a one-third tuck to taper the splice to insure greater strength. Thimbles should be used in eye splices wherever possible.

8. Storing. Manila rope must be stored in a cool dry room with plenty of ventilation to avoid dry rot and mildew. Synthetic, while not subjected to dry rot and mildew, should be stored at moderate temperatures

away from steam pipes and direct sunlight. Store all lines in a box or cover with a top with ventilation to keep temperature at a minimum.

9. Chaffing. Chaffing will occur with surface contact either on itself or an external fitting such as bitt, cleat, chock or block or fair leader. Care must be taken to keep all surfaces smooth and paint and rust free. Nicks should be filed down or grounded smooth. Special care must be taken where wire rope was used previously. Wherever possible, use a wire rope or chain pennant so that the fibre rope is completely outboard. Avoid all sharp edges and bends and see that the bending radius is not less than four times the diameter of the rope. Chafing gear should be used wherever possible. Discarded fire hose skinned on the line before splicing has proved satisfactory for this.

10. Recognition of damage. It is often very difficult to detect damage to a manila rope. If there is no dry rot present, spread the strands and check for strand abrasion in the core of the rope. Try to test the fibre strength by comparing it with the fibre from a new rope. On larger ropes cut out one inside yarn, remove turn and test the individual fibres for strength comparing it with a fibre from a new rope.

An experienced rope handler can determine much by general appearance. It is much more difficult to determine internal damage in synthetic ropes. Look over the line carefully for surface cuts and chaffed places. Glazing or fuzzing on the surface ordinarily does not have an appreciable effect on the strength of the rope. Often this fuzziness acts as cushion to help to prevent further chaffing and abrasion. Cut off a one foot piece and count the number of broken yarns. This divided by the total number of yarns in the rope will give an approximate percentage of the strength left.

11. Thimbles. Ordinarily pear or round shaped thimbles are usually satisfactory for manila. Due to the greater strength and stretch of synthetics, special heavy duty reinforced thimbles should be used. There are several manufacturers making special synthetic rope thimbles. It is advisable to use thimbles that have guides or lugs on the outside to hold the rope in place. As a synthetic rope stretches, the eye will elongate and the thimble will have a tendency to "pop" out. Pear shaped thimbles should be

seized in the eye on both sides and the double rope at the thimble vertex. This

seizing should be done under tension if possible.

MEASURING THE INDIRECT COSTS OF ACCIDENTS

By RALPH A. GUFFEY

Safety Director, A. L. Mechling Barge Lines Inc., Joliet, Ill.

Safety as applied upon the inland waterways is confined to construction specifications, operating rules and regulations, and rules regarding personnel safe practices.

Construction specifications of barges and towboats is administered by both the American Bureau of Shipping and the United States Coast Guard. Operating rules and regulations arise from joint conferences of the Western River's Panel and the United States Coast Guard. The U.S. Department of Labor promulgates rules regarding the safety of Longshoremen and those workers engaged in ship-breaking and repair. Rules regarding personnel operating safety are industry originated with two organizations, The American Waterways Operators and the Inland Waterway Safety and Health Association, devoting attention to this phase of safety.

The 20 members of the Inland Waterway Safety and Health Association meet bi-monthly to review and discuss accidents and personal injuries. Safety films, posters, and visual aids are originated and distributed to the membership, and an attempt is made to coordinate the safety activities of member companies. The safety committee of the American Waterways Operators originates safety posters and co-sponsors with the Marine Section of the National Safety Council, the Marine Safety Contest.

A measure of the success of these agencies in reducing personal injuries is found in National Safety Council statistics and graphs showing the severity and frequency rate of accidents by industry. The Marine Industry as a whole stands third highest of all industries with an accident frequency rate of 29.29 and a severity rate of 190 days being charged per injury for 3,104 reported injuries. Those companies participating in the National Safety Council Marine Contest have a 13.12 frequency rate with no statistics shown for severity rate. The 13.12 frequency rate would place them in 33rd instead of

41st position of the marine industry as a whole. Since the average frequency rate for all industries is 6.45, the rate of the participating companies, while proving that some safety is better than none—emphasizes the need for extensive safety effort, and to accomplish further reduction of injuries and accidents involving equipment damage or loss, effort other than what has been exerted in the past must be made.

It is also clear, that we have an abundance of regulatory agencies . . . which demonstrates that unless the purpose of rules and regulations are fully understood, complied with and enforced . . . they will not insure safety. Furthermore, it is also obvious that meetings of industry safety committees and our session here today, do not produce the ultimate in safety results.

Why then, if the industry has recognized the need for safety as is evidenced by the production of all the rules and regulations we have today, have the countless hours industry committees have devoted to safety failed to produce the desired results?

I believe that the main reason is a rather simple one . . . we have failed to educate management on the importance of safety.

A large segment of our industry looks upon safety as a necessary nuisance instead of a necessity, and to many people, including management as well as operating personnel—safety is O.K. as long as it causes no delays, inconvenience or doesn't cost anything.

Safety, as a word, has many definitions. Because what constitutes safety to you may be meaningless to someone else, it is easily seen that the misunderstanding of the importance of safety will be denied, unless some common denominator is present to cause cohesion of safety effort or commonness of purpose.

We will dispense with the humanitarian, legal, or other motives for safety since these motives alone, do not form this cohesion.

Our common denominator is costs, and rare is the company that is not interested in costs.

When a company has high personal injury and equipment damage, they, by economic necessity, become motivated by increased insurance costs or legal implications. This leads to the activation of safety interest or in setting up a safety program.

A measure of that company's understanding of the importance of safety, will be reflected in the program set-up, and the company support given to the person who is to assume direction of this program.

Companies who have recognized that safety goes beyond the conventional motives, and have unified safety with all phases of their company operations, prove daily that when the economic role of safety is recognized there is increased operating efficiency and income.

This unification has various names, such as hazard control, loss control, risk management, total-loss-control, or other titles that recognizes the fact that the company profits by eliminating or reducing loss potential. Where this loss-potential or "total-loss" approach is recognized you will find unrestrictive support from top management who have placed safety in an effective overall concept.

Because safety overlaps all phases of operations, full safety effectiveness cannot be made by setting up a safety program or department devoted solely to personnel safety, when operations, maintenance, insurance, traffic or sales operates under different safety motives. The overlapping of responsibilities, duplication or lack of efforts, results in a conflict of safety purpose. Safety cannot be separated from these functions, but must be drawn together, where the recognition of hazards, elimination of hazards, protection against hazards, evaluation of risks, assumption of risks and transfer of risk is made. This drawing together is the beginning of the "total-loss" concept.

To reduce accident loss, we must be able to pin-point these losses by recognizing and trying to eliminate all the possibilities for loss within the total operation.

How do we measure these losses?

In building up total accident costs we

must, in addition to considering "direct" costs, measure the "indirect" costs. Indirect costs are the costs most often ignored in our accounting because they are the costs which are hidden, and not easily measured, but they are present in every personal injury, accident to equipment, or damage to property.

"Direct costs" are easily recognized. The cost of medical attention, hospital care, maintenance, legal and insurance costs, and claim settlements are some of these costs generally associated with injuries.

I would suggest that you sit down with your accountant and ask him to pinpoint your company's present method of determining all the costs of a particular injury or damage to equipment. If equipment lost-time, lost-barge-revenue and towboat-lost-time is not included in this analysis, then I believe you are not measuring the "total loss" cost of accidents.

Because ton-mile-production and cost-per-ton-mile is the normal method of computing towing rates or establishing operating costs, it is important that "cost-per-minute" time losses arising from accidents to personnel or damage to equipment, not be hidden in the various accounting procedures of the company's bookkeeping. Since our purpose in accident loss prevention is to recognize and control all the possibilities for loss within the total operation, it will not be possible to pin-point these losses, or to spot operating inefficiencies unless we compute towboat and barge costs in the smallest increment, "cost-per-minute" time losses.

For example, if we had a personal injury requiring hospitalization of a deckhand, aboard a 15 barge tow, we would in addition to assuming all the direct costs of this injury, lose barge revenue and decrease towboat-ton-mile-production.

How would we measure the lost-barge revenue arising from this accident? A simple way would be to divide the total number of barges the company operates during the year into that year's total revenue. This will give you individual barge revenue per year. By breaking this revenue into daily, hourly and minute increments, we can convert hidden operating lost time into actual lost-barge revenue.

To continue this example . . . if we have