Directorate of Science, Technology and Medicine
Office of Science and Technology Assessment

Longshoring and Marine Terminals:

Hazard and Abatement Summaries

The Occupational Safety and Health Administration's (OSHA) Directorate of Science, Technology and Medicine developed guidesheets to provide information on fatal occupational hazards, and preventive actions that could be taken to make the workplace safer. This document is not a standard or regulation, and it creates no independent legal obligation. It is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace.

Further information about this bulletin may be obtained by contacting OSHA's Directorate of Science, Technology and Medicine at (202) 693-2300.

TABLE OF CONTENTS

INTRODUCTION

One of the goals of the Occupational Safety and Health Administration (OSHA) is to reduce the rate of injuries and illnesses in the Longshoring/Marine Terminals Industry. To help reduce these rates, OSHA published updated safety and health rules in July, 1997 which address cargo handling and related activities conducted aboard vessels (see the Longshoring standard at 29 CFR Part 1918) and landside operations related to the movement of vessel cargo (see the Marine Terminals standard at 29 CFR Part 1917). The Power Industrial Truck (PIT) training standard was published in 1998 to reduce incidents involving PIT accidents. In support of these initiatives, the Office of Science and Technology Assessment in OSHA's Directorate of Science, Technology and Medicine, developed Hazard and Abatement Summaries to help employers and workers in the maritime cargo handling industry to recognize and control the significant hazards commonly experienced in longshoring and marine terminal operations. The marine cargo handling industry representatives of the Maritime Advisory Committee for Occupational Safety and Health (MACOSH), and the National Maritime Safety Association technical committee provided input and technical guidance.

This document is comprised of guidesheets that address the most frequent sources of fatalities in the maritime cargo handling industry. Each guidesheet contains a hazard summary describing the circumstances that may have contributed to the hazards and how the specific accident could have been prevented. Each hazard summary specifically denotes the industry process, the employee's activity at the time of the incident, the hazard to which the employee was exposed and the probable cause of the fatality. Control measures for preventing similar incidents in the future are recommended**.** Illustrations present a visual depiction of the situation being addressed. Reference materials are included, such as the specific standards that were applicable to the incident. Other relevant standards and control measures that were not directly attributable to the fatality but which nonetheless may be useful for training on similar maritime cargo handling operations are also included. These suggested control measures are recommendations and may not reflect OSHA requirements.

The guidesheets reflect 37 actual OSHA case file summaries of workplace incidents in which longshoring workers were killed while performing their jobs. The guidesheets are divided into three major categories: vehicular accidents, falls/drowning, and material handling accidents. The most frequent cause of longshoring fatalities were accidents in which employees were struck by or run over by vehicles such as trucks, front-end loaders, or forklifts. The next most frequent causes of death were by falling or drowning. The remaining fatalities occurred while employees were performing a variety of cargo and material handling activities involving improperly loaded fork lifts, unstable cargo that toppled over, and working below improperly secured loads that fell from cranes.

We believe these guidesheets can help employers better evaluate their respective operations and take the necessary action to make their workplaces safer. Also, these guidesheets are intended to increase the safety and health awareness of workers and provide them additional insight regarding accident avoidance.

SECTION I

VEHICULAR ACCIDENTS

VEHICULAR ACCIDENTS

Summary No. 1 - Front-End Loader Operations

Hazard
Employees were exposed to the hazard of being struck by a front-end loader.

Process
A front-end loader is used to move railcars from one track to another for loading.

Activity at time of incident:
A longshoreman walked between two railroad tracks and stepped into the path of a front-end loader as it backed up.

Incident Description
Setting:
Longshoremen are using the bucket of a front-end loader to push empty rail cars from one rail track to another, using the bucket of a front-end loader. The tracks are located near a grain loading area at a marine terminal facility. The front-end loader operator moves the railcars from the "empty" track to the "load" track. These tracks are parallel and about 12.5 feet apart. The operator backs up in a semi-circle to move between the tracks. The front-end loader was not equipped with a back-up alarm.

Incident:
About five minutes before the incident, a longshoreman working in a different part of the facility walked over to the area between the two tracks, passing between two railcars on the load track. At the same time, the front-end loader operator had just finished pushing two railcars along the load track to make room for another car and was backing up in a semi-circular direction from the load track to the empty track. The front-end loader operator was not aware that the longshoreman had entered the area and did not see him as he looked over his right shoulder while backing up. The longshoreman, who was standing about three feet from the rear of the front-end loader, was run over and killed by the vehicle's right rear tire.

Relevant Factors:
The front-end loader was manufactured in 1971 before back-up alarms were available as standard or optional equipment.

Applicable Standards and Control Measures

- 29 CFR 1917.17(b): Railroad facilities. "A route shall be established to allow employees to pass to and from places of employment without passing under, over or through railcars, or between cars less than 10 feet (3m) apart on the same track."

This hazard could have been prevented if the employer had established safe access routes and work

areas for employees who must pass through or work in areas where the front-end loader was operating.

Other Relevant Standards and/or Control Measures

- Strobe lights may be useful in alerting the victim to the presence of the front-end loader.
- Back-up alarms are not required unless they were originally installed by the manufacturer. If the front-end loader is not equipped with a reverse signal alarm, an employee should be stationed at the operation to signal when it is safe to back up whenever the operator has an obstructed view to the rear.

VEHICULAR ACCIDENTS

Summary No. 2 - Front-End Loader Operations

Hazard

Employees were exposed to the hazard of being struck or run over by a front-end loader performing operations after dark under limited lighting.

Process

Operators of front-end loaders were loading piled furnace slag into dump trucks. The slag had been off-loaded from the ship to the dock.

Activity at time of incident:

Operator was backing up a front-end loader in the dark after dumping a load of slag into the dump truck while the supervisor was walking through the work area.

Incident Description

Setting:

Three employees, two front-end loader operators and a laborer, are involved with loading furnace slag into a dump truck at night. The two front-end loader operators scoop furnace slag from a pile on the dock and load it into a dump truck for transport. The slag cannot be dumped directly from the ship into the dump truck because it is too small. The front-end loaders scoop slag from the pile, back up, turn the loader around 180 degrees, and transport the load to the dump truck. After dumping the slag into the dump truck, the loader backs up, turns around 180 degrees, and returns to the slag pile for another load. The laborer is responsible for manually shoveling the slag to maintain a neat pile. A fourth employee, the supervisor, enters the work area at the time of the incident.

Incident:

The operator of the front-end loader had just completed dumping a load of slag into the dump truck and proceeded to back up while looking over his left shoulder toward the back left side of the loader. He did not look toward the back right side of the loader as he was backing up. While he was backing up, the supervisor was walking into the work area, with his head down approaching the right rear of the front-end loader. The laborer who witnessed the incident, stated that although he saw the supervisor walk into the work area, he lost sight of him momentarily as the front-end loader was backing up but noticed that it ran over something. The laborer immediately motioned to the operator to stop backing up. He went over to the front of the loader and found the supervisor lying on the ground. The supervisor had been fatally struck and run over by the right front tire of the front-end loader.

Relevant Factors:

At the time of the incident, the front-end loader was operating with broken front and rear lights. Employees were not trained to avoid entering the work area where the loaders were operating.

The loading operation was being performed after dark under limited lighting conditions. The operator of the front-end loader was certified by the company supervisor and authorized to operate the front-end loader in the functions he was performing (driving forward, backward, scooping product into the bucket and dumping the bucket).

Applicable Standard(s) and Control Measures:

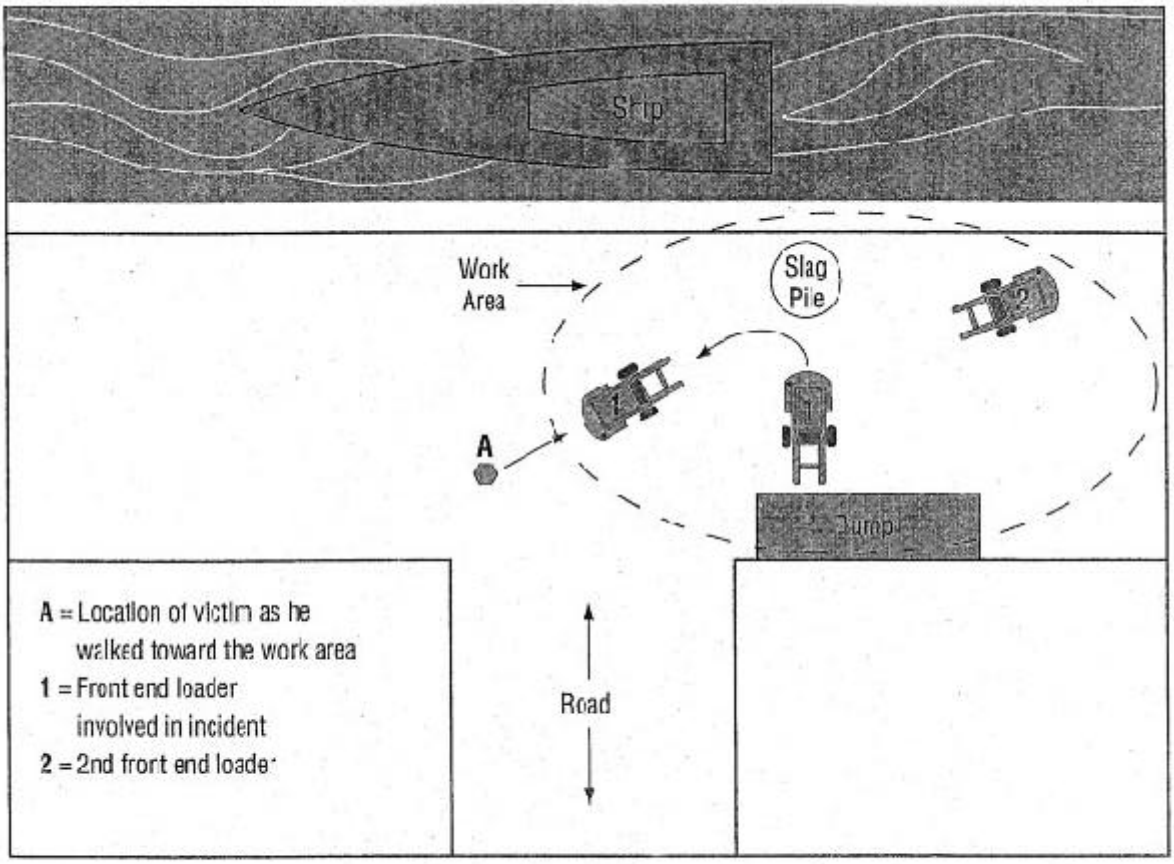
- 29 CFR 1917.43(c)(5): Powered Industrial Trucks - Maintenance. "Powered industrial trucks shall be maintained in safe working order. Safety devices shall not be removed or made inoperative . . . ."

These hazards could be prevented by the following:

- Operating the front-end loader with properly working front and rear lights and rear view mirrors;
- Maintaining the front-end loaders in safe operating condition and taking them out of service if defects make them unsafe to operate;
- Using a reverse signal alarm that is distinguishable from the surrounding noise level. If it is not equipped with a reverse signal alarm, an employee should be stationed at the operation to signal when it is safe to back up whenever the operator has an obstructed view to the rear. (Good work practice);
- Prohibiting workers from passing through an area where there is danger of being hit by a front-end loader; and
- Providing adequate illumination (at least 5 foot-candles) during equipment operations, pursuant to 29 CFR 1917.123(a).

Other Relevant Standards and/or Control Measures:

- Strobe lights may be useful in preventing this hazard.



Vehicle Accidents Summary No.2

Incident Description: Front-end loader #1 struck victim (A) while backing up.

VEHICULAR ACCIDENTS

Summary No. 3 - Ro-Ro Operations

Hazard
Employees working in vehicle loading lanes on a barge were exposed to the hazard of being struck by a tractor-trailer truck.

Process
Longshoring roll-on roll-off (Ro-Ro) operations were taking place. Vehicles were being loaded onto a barge.

Activity at time of incident:
An employee was lashing a vehicle to the deck of a barge as a tractor-trailer truck was backing up in an adjacent lane.

Incident Description
Setting:
Longshoremen are loading vehicles into a barge, in a Ro-Ro operation. The barge is used to transport wheeled cargo, such as passenger cars and containerized freight that is mounted on flatbed trailers. This is a typical Ro-Ro operation involving a high concentration of vehicle and pedestrian traffic on the vessel and pier. The barge, which is approximately 730 feet long and 300 feet wide, has three cargo decks and is enclosed at the bow on the first and second decks. The vessel is open on all three decks at the stern, where the vehicle access ramp is located.

Each deck has10 vehicle loading lanes. The loading lanes are separated by concrete curbs (rub rails), and the drivers position their vehicles between these rub rails. Each vehicle is driven into a predetermined (by weight) loading lane, moving in either a forward or reverse direction as necessary. Other employees who work in the lanes, manually securing (lashing) the vehicles, with nylon web straps, either to fixtures on the deck or to stanchions on the rub rails. Other employees walk from lane to lane, using flashlights to signal the drivers. The vehicle loading and lashing operations take place at the same time, and thus pedestrians operate in the same vicinity as the drivers of the vehicles being loaded. The first and second decks are closely loaded and only marginally illuminated.

Incident:
The employee (victim) was lashing a boat trailer to the first deck of the vessel in one lane while lying partially on the deck in an adjacent lane. A tractor trailer truck backed up into the same lane where the employee was lying.. The right rear wheels of the trailer chassis struck the victim and ran over his legs He died a week after the incident.

Relevant Factors:
The employer failed to develop and implement an organized traffic control system to protect pedestrians working in the same lanes as vehicular traffic.

The concrete rub rail dividing the lanes where the accident occurred was approximately 6 inches high and 22 inches wide. Drivers relied almost exclusively on these rub rails to guide their tires in the cargo lanes. The tractor-mounted mirrors have inherent blind spots due to the length of the trailers (40 to 53 feet). The reverse signal alarm on the truck involved in the accident was in operable condition, although the driver could not recall whether the alarm sounded during the accident.

Other safety issues raised during the investigation included carbon monoxide monitoring on the vessel, fixed traffic control signs, dock marking, and the use of traffic cones during Ro-Ro operations. However, only the citations listed in the following section were issued to the employer.

Applicable Standards and Control Measures

- 29 CFR 1918.86(n): Roll-on roll-off (Ro-Ro) operations - Vehicle stowage positioning. "Drivers shall not drive vehicles, either forward or backward, while any personnel are in positions where they could be struck."

This hazard could have been prevented if workers were instructed to stay within the designated work area, and if strobe lights were provided for better employee visibility.

Also, spotters could be used when backing vehicles with obscured views to the rear.

VEHICULAR ACCIDENTS

Summary No. 4 - Night Time Ro-Ro Operations

Hazard
Employees performing Ro-Ro operations during the night shift were exposed to the hazard of being struck by a container on a chassis.

Process
Containers of various lengths are loaded onto a barge during a Ro-Ro operation.

Activity at time of incident:
An employee was working in a lane where vehicles were backing up.

Incident Description
Setting:
Longshoremen are performing a Ro-Ro operation aboard a barge at night. The barge has three decks, with vehicle lanes divided by concrete rub rails. During a regular night shift, the crew consists of 19 drivers, about 30 longshoreman, three supervisors (one per deck), and one maintenance supervisor. Containers of varying sizes are loaded during the operation, ranging in length from 20 to 53 feet. Additionally, some of the trucks' tires blocked some of the lights that were placed along the side of the barge affecting the actual intensity of the illumination. The longshoreman on deck use their hands, whistle, hard hat and/or flashlights to notify the truck drivers of their position.

Incident:
At the time of the incident, a longshoreman assisting with Ro-Ro operations was working in the lane on the third deck as a truck driver hauling a 53-foot-long container started backing up. At one point, while backing up, the driver noticed a hard hat on the ground, and believed it had been placed there by the hook-up man to indicate where the truck driver should stop. The driver continued to back up but stopped after feeling a bump. While backing up, the truck struck and killed the longshoreman working in the lane.

Relevant Factors:
The victim was not wearing a high visibility vest at the time of the incident. Although employees were provided with high visibility vests, they were not required to wear them. The lighting was so poor in the area where the victim was struck that the supervisor had to use a flashlight to identify the victim. Although employees were provided with strobe lights to put on their shirt sleeves, it did not solve the visibility problem at the terminal and its use was optional. The truck's back-up alarm was working but may not have been heard due to the noise generated by the Ro-Ro operations.

Truck drivers had not received initial or refresher training.

Applicable Standards and Control Measures

- 29 CFR 1918.86(m): Roll-on roll-off (Ro-Ro) operations - Authorized personnel. "Only authorized persons shall be permitted on any deck while loading or discharging operations are being conducted. Such authorized persons shall be equipped with high visibility vests (or equivalent protection)."

- 29 CFR 1918.86(n): Roll-on roll-off (Ro-Ro) operations - Vehicle stowage positioning. "Drivers shall not drive vehicles, either forward or backward, while any personnel are in positions where they could be struck."

- 29 CFR 1918.92(a): Illumination - Walking, working, and climbing areas. "Walking, working, and climbing areas shall be illuminated. . . . illumination for cargo transfer operations shall be of a minimum light intensity of five foot-candles (54 lux). Where work tasks require more light to be performed safely, supplemental lighting shall be used."

This hazard could have been prevented if the employer had ensured that employees working on decks during Ro-Ro operations were clearly visible to the driver. The employer could have ensured this visibility by providing and requiring the use of high visibility vests with retro reflective material, strobe lights, or equivalent protection, and by requiring adequate illumination of the deck areas. Additionally, the employer should have ensured that there were clear communication signals between the truck driver and the employees on the deck, and that pedestrians remained out of the truck lanes at all times during Ro-Ro operations.

Other Relevant Standards and/or Control Measures

- 29 CFR 1910.178(l)(4)(i): Powered Industrial Trucks - Refresher training and evaluation. "Refresher training, including an evaluation of the effectiveness of that training, shall be conducted as required by paragraph (l)(4)(ii) to ensure that the operator has the knowledge and skills needed to operate the powered industrial truck safely."

Truck drivers should be trained in the operation of vehicles used in Ro-Ro operations to prevent unsafe practices.

VEHICULAR ACCIDENTS

Summary No. 5 - Container Ship Unloading/Transfer Operations

Hazard
Employees were exposed to the hazard of being struck by a container truck operating in a high traffic area on a dock.

Process
Cranes were used to unload and transfer containers from a vessel to trucks equipped with container chassis.

Activity at time of incident:
A longshoreman was working in the "safety lane" between two truck lanes at the dock when he fell into the adjacent truck lane.

Incident Description
Setting:
Three cranes are used to transfer containers from a container ship to trucks equipped with container chassis. There are three parallel truck lanes, each about 10 feet wide. Each lane is served by a separate crane: the north lane is used for offloading the bow section of the vessel, the middle lane is used for offloading the vessel's middle section, and the south lane serves the vessel's stern. In between each lane there is a three-foot wide corridor (called a "safety lane"), which is used by longshoremen working on the ground between the trucks and is also used for storing twistlocks. The purpose of the safety lanes is to prevent truck drivers from inadvertently crossing over into another truck lane. The four longshoreman are placing and removing twist locks under the containers.

Three crews are working simultaneously, each unloading a separate section of the vessel. There are four longshoremen per crew, two at each end of the truck, and one checker for each crew who maintains contact with the crane operator via radio to give instructions should there be any problems with the positioning of the containers or twistlocks. Another crew member gives signaled instructions to the crane operator. Each crew also has six truck drivers. Drivers maintain a distance of 3 to10 feet between the trucks in each lane. The trucks generally move at 5mph and travel in one direction. The checker works in this space to document the container number and check on the contents of the container.

Incident:
A longshoreman was working in the north lane installing a twistlock on a container. At the time of the incident, he had signaled a truck driver in the middle lane to proceed past him. As the truck passed him, the longshoreman apparently slipped or tripped and fell into the path of the rear section of the truck. He was killed after being struck by the rear wheel of the chassis.

Relevant Factors:
There were no eyewitnesses to the incident, and the exact cause of the victim's fall is not known. There was some speculation that he tripped on the twistlocks that were on the ground and fell into the rear wheels of the moving chassis.

Supervisors had not received formal training in accident prevention. Moreover, vehicles were crowded on the dock, so that a distance of 3 to 10 feet was maintained between vehicles parked in the lanes during loading and discharging operations rather than the required minimum distance of 20 feet between vehicles.

Applicable Standards and Control Measures

- 29 CFR 1917.11(a): Housekeeping. "Active work areas shall be kept free of equipment and materials not in use, and clear of debris, projecting nails, strapping and other sharp objects not necessary for the work in progress."

Although the exact cause of the longshoreman's fall is not known, this hazard may have been prevented if the safety lanes had been kept clear of all materials, such as twistlocks, that posed tripping hazards to the longshoremen working on the ground.

- 29 CFR 1917.27(b)(1): Personnel - Supervisory accident prevention proficiency. "After October 3, 1985 immediate supervisors of cargo-handling operations of more than five (5) persons shall satisfactorily complete a course in accident prevention. Employees newly assigned to supervisory duties after that date shall be required to meet the provisions of this paragraph within ninety (90) days of such assignment."

This accident may have been prevented if the employer had provided accident awareness training to supervisors in accordance with 29 CFR 1917.27(b)(1), including the following topics: safety responsibility and authority, elements of accident prevention, and recognition of longshoring hazards.

This accident may also have been prevented if housekeeping had been emphasized and the dock cleared of twist locks and other tripping hazards.

VEHICULAR ACCIDENTS

Summary No. 6 - Container Ship Unloading/Transfer Operations

Hazard
Employees were exposed to the hazard of being struck by/run over by a truck operating in a high traffic area on a dock.

Process
A shore-based crane is used to unload and transfer intermodal shipping containers from a vessel to trucks equipped with container chassis.

Activity at time of incident:
The clerk supervisor was walking on the dock in the narrow space between two trucks, performing container checks and handling paperwork.

Incident Description
Setting:
A container vessel loaded with two different kinds of containers, a standard container and a refrigerated (reefer) type, is moored to the dock. A shore-based crane lifts containers off the vessel and places them onto the container chassis of hustler yard trucks parked at the dock. The trucks, which are 8 feet wide and 55 feet long, then transport the containers to a designated location in the holding yard. The dock is approximately 40 feet wide and has four truck lanes, each approximately 9.75 feet wide (inside to inside), running parallel to the moored vessel. When both types of containers are unloaded from vessels, it requires two way traffic because the containers are placed onto the vessel in a different manner. The painted lane markings are very worn and difficult to see. Only a few traffic cones are in the area to identify the individual lanes.

Two gangs are unloading the container vessel. Each gang consists of truck drivers, longshoremen (who secure the containers on the truck chassis), a foreman (to supervise the gang operation), a crane operator, and ship clerks. The ship clerks walk on the dock among the trucks, checking the container numbers against the chassis numbers, visually inspecting the containers and handling paperwork.

Incident:
The crane operator was unloading empty reefer containers from the vessel and placing them onto the hustler yard trucks. The first three lanes closest to the vessel were in use, occupied by a total of four trucks – one truck in each of the first two lanes (closest to the vessel) and two trucks facing in the opposite direction in the third lane. The rear truck in the third lane was not parked completely within its own lane. Its wheels projected into the second lane about three feet from the adjacent truck. A portion of the tires was in the narrow space in which the clerk supervisor was working, giving orders to the truck drivers who were traveling in opposite directions. He was wearing an orange reflective vest and Personal Protective Equipment (PPE) - a hard hat, proper footwear, and clothing to cover the body. As the front truck in the third lane finished loading and pulled away, a longshoreman signaled the rear truck

in the third lane to move into position to receive a container. The truck driver checked the left side mirror but not the right side mirror (the side where the clerk supervisor was standing) and began pulling forward. He did not see the clerk supervisor entering the path of the chassis tires. The truck's tandem rear wheels struck the clerk supervisor who was killed after being run over by the rear wheels as the truck pulled forward. The driver was traveling slowly, approximately one to five miles per hour, and traveled approximately 21 feet before stopping.

Relevant Factors:
The lane markings were very worn in the work area and not adequately marked to ensure orderly traffic flow and to minimize congestion. Additionally, there were no established, routine procedures for directing and positioning truck traffic on the dock.

The rear tires that struck the employee were visible in the driver's right rear view mirror. The truck driver involved in the accident did not see the clerk supervisor. He and several other drivers indicated that they typically do not check their right mirrors when they are signaled to pull forward.

Employee safety training and enforcement were inadequate, based on the failure of drivers to use mirrors when pulling out of a parked position, the presence of poorly marked traffic lanes and the lack of cones at the accident site to identify lanes.

Applicable Standards and Control Measures

- 29 CFR 1917.44(f): Cargo Handling Gear and Equipment - General rules applicable to vehicles. "Vehicular routes, traffic rules, and parking areas shall be established, identified, and used."

This hazard could have been prevented if the employer had established clearly marked vehicle traffic lanes and pedestrian walkways that were wide enough to safely accommodate both trucks and the workers on foot. Resurfacing the dock and adding reflective stripping would have made the lanes easier to see at dusk/night or during rain. Additionally, the employer should have developed and enforced procedures for directing and positioning truck traffic on the dock. The hazard may also have been prevented if alternative procedures had been established to minimize or eliminate the need for clerks and other pedestrians to work in close proximity to the trucks.

Other Relevant Standards and/or Control Measures

- 29 CFR 1910.178 (l)(1)(i): Powered industrial trucks - Operator training - Safe operation. "The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by the successful completion of the training and evaluation specified in this paragraph (1)."

Employees should receive effective training in vehicular safety. For example, drivers should check both side mirrors before pulling forward and be alert to workers on the dock.

VEHICULAR ACCIDENTS

Summary No. 7 - Container Loading/Unloading Operations

Hazard

Employees were exposed to the hazard of being struck by a truck operating in a high-traffic area on a dock.

Process

Intermodal shipping containers are being lifted from the vessel with a shore-based crane onto chassis on the dock. Trucks take the containers to a storage area of the port and then bring selected containers to the crane to be loaded onto the vessel.

Activity at time of incident:

A longshoreman was standing in a high-traffic area on the dock after handing paperwork to the truck driver, when the truck driver made a U-turn near the longshoreman. His truck was not pulling a chassis.

Incident Description

Setting:

Longshoremen are loading containers from chassis onto a vessel, using a shore-based crane. The trucks deliver the empty chassis to a storage area at the marine terminal facility, and occasionally haul selected containers to the crane area, where they are loaded onto the vessel. There are about 24 truck drivers working in three lanes at the dock, eight trucks per lane. A longshoreman works on the dock in the traffic area, directing trucks, handing paperwork to the drivers, and occasionally speaking into a microphone mounted at his shoulder.

Incident:

A truck driver was obtaining a chassis in the storage area, when he was contacted by radio and asked to return to the crane area on the dock. When the truck arrived at the crane area, the longshoreman handed the driver some paperwork through the driver's window and began to walk away. The driver then proceeded forward and made a U-turn to the left. The truck's right front wheel (on the passenger side) struck and killed the longshoreman.

Relevant Factors:

Employers provided refresher training quarterly to yard truck drivers and signalers, emphasizing the need to be alert to pedestrians working near moving vehicles.

Driving lines on the dock area were repainted and in good condition. The lighting was adequate and the overhead crawler cranes have lights that shine down on the dock area.

The truck was inspected and found to be in working order, including brakes, wipers, lights, and horn.

Applicable Standards and Control Measures

- 29 CFR 1910.178 (l)(4)(ii)(A)(B): Powered industrial trucks - Operator training - Refresher training and evaluation. "Refresher training in relevant topics shall be provided to the operator when:
  (A) The operator has been observed to operate the vehicle in an unsafe manner;
  (B) The operator has been involved in an accident or near-miss incident."

This hazard may have been prevented if the employer had ensured that all employees involved in the operation, including the truck driver and longshoreman, were trained in hazard recognition and pedestrian safety.

Additionally, remind drivers to ensure all ground personnel are clear of the vehicle prior to moving.

Other Relevant Standards and/or Control Measures

- Develop a system to ensure that truck drivers whose services were provided through the local union were properly trained in safe dock operations.

- Revise the work procedures for the longshoreman and other employees working near the trucks, to reduce the need for them to work on the dock areas.

- Improve traffic conditions in the congested tractor-trailer truck loading area, such as widening the truck lanes.

VEHICULAR ACCIDENTS

Summary No. 8 - Forklift Truck Operations

Hazard
Employees were exposed to the hazard of being struck by a lift truck transporting a load that obstructed the forward view.

Process
Material handling–loading both break bulk cargo and intermodal shipping containers on a wharf.

Activity at time of incident:
The operator of a forklift truck with a front squeeze attachment was carrying a load of two rolls of paper stacked on top of each other to load into a container. He drove out of the warehouse along the right side of a top loader and container to deliver the paper rolls. A clerk was walking on the wharf along the left side of the top loader at this time.

Incident Description
Setting:
A lift truck operator with a squeeze attachment was carrying two rolls of paper from a warehouse to the container located on the wharf. Each load consisted of two rolls, stacked one on top of the other. The load was 64 inches tall and 40 inches in diameter, and weighed 2,600 pounds. The operator drove with the load positioned in front of him, with the bottom roll about 12 inches off the ground. This put the top roll of paper approximately 11 inches higher than the steering wheel which obstructed the forward view. At the same time, a top loader was operating on the wharf apron, shifting containers around in preparation for loading them on the ship. A third employee, a clerk, walked onto the wharf during this operation.

Incident:
At the time of the incident, the top loader operator had set a 20-foot container in the open area west and upriver of the warehouse door. The longer side of the top loader was parallel to the river. The clerk exited the warehouse door and proceeded to walk along the left side of the top loader. The lift truck operator drove out of the warehouse door and veered to the right side of the top loader to reach the container. The lift truck and the clerk were going in the same direction on opposite sides of the container. The clerk walked past the end of the container, into the path of the oncoming lift truck. The lift truck driver's view of the clerk was blocked by his load of paper rolls. The truck struck and crushed the clerk beneath the load of paper rolls.

Relevant Factors:
The top of the lift truck load (paper rolls) blocked the driver's forward view. The lift truck operator took a wide turn around the top loader because the front load obstructed his vision.

The lift truck operator failed to drive the truck with the load trailing which would have enabled the driver to see the clerk walking.

Applicable Standards and Control Measures

- 29 CFR 1917.43(b)(9): Powered industrial trucks - General. "If the load obstructs the forward view, the employer shall direct drivers to travel with the load trailing."

This hazard could have been prevented by requiring the operator to travel with the load trailing to ensure that he had a clear forward view.

Additionally, safety signs reminding workers to avoid blind spots around machinery as well as reminders by the supervisor might have prevented this accident occurrence.

Other Relevant Standards and/or Control Measures

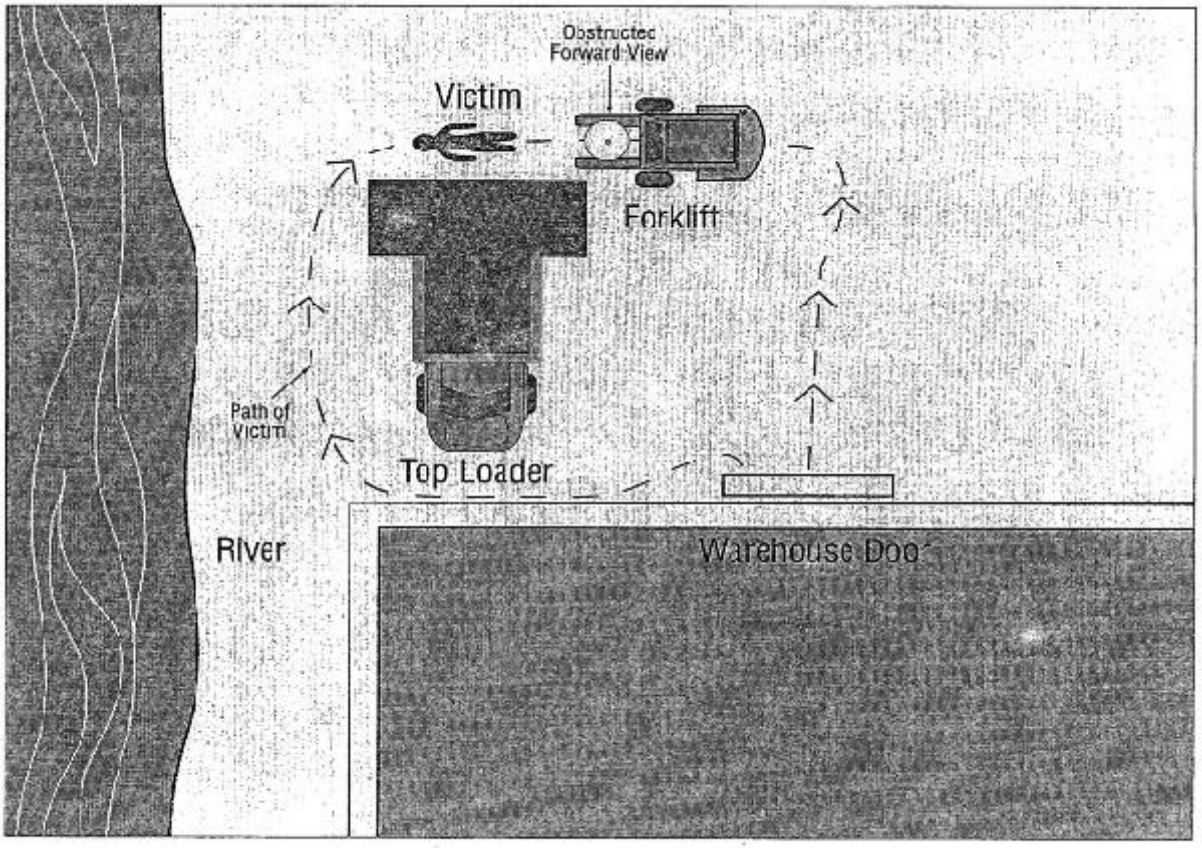
- 29 CFR 1917.43(b)(8): Powered industrial trucks - General. "The employer shall direct drivers to slow down and sound the horn at crossaisles and other locations where visibility is obstructed."

Operators are required to sound the horn at turns whenever the field of vision is obstructed.

- 29 CFR 1910.178(l): Powered industrial trucks - Operator training. "The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by the successful completion of the training and evaluation specified in this paragraph (l) ."

Operators must be trained, through initial and periodic refresher training, to observe all safe operating procedures.

Additionally, safe access routes must be established for pedestrians who pass through areas where lift trucks are operating.



Vehicle Accidents Summary No.8

VEHICULAR ACCIDENTS

Summary No. 9 - Forklift Truck Operations

Hazard
Employees were exposed to the hazard of being struck by a forklift operating with an obstructed forward view.

Process
A forklift with a clamp attachment is used to carry rolls of newsprint from a warehouse to a container for shipment by truck.

Activity at time of incident:
A forklift operator was proceeding towards an intermodal shipping container as an employee on foot was crossing in front of the container.

Incident Description
Setting:
A forklift operator is transferring rolls of newsprint from a storage area in a warehouse to a container at a loading dock for truck shipment. The operator carries a single roll at a time, with the load attached in a clamp in front of the forklift. Each roll weighs approximately 5,000 pounds. The forklift operator travels through several passageways in the warehouse to reach the container. The operator loads the roll of newsprint into the container from an elevated platform adjacent to the container.

Incident:
At the time of the incident, an employee was crossing the loading dock as the forklift was entering the container. The employee was killed after being caught between the container and the forklift's load, a 5,000-pound roll of newsprint.

Relevant Factors:
Forklift operators failed to use their horns when approaching locations where visibility was obstructed.

Supervisors had not received formal training in accident prevention.

Applicable Standards and Control Measures

- 29 CFR 1917.43(b)(8): Powered industrial trucks - General. "The employer shall direct drivers to slow down and sound the horn at crossaisles and other locations where visibility is obstructed."

This hazard might have been prevented if the employer had ensured that the forklift operator had a clear forward view, used a spotter when entering the container, and sounded the horn whenever visibility was obstructed.

- 29 CFR 1917.43(b)(9): Powered industrial trucks - General. "If the load obstructs the forward view, the employer shall direct drivers to travel with the load trailing going from the warehouse to the container."

This hazard might have been prevented if the forklift operator had a clear forward view by traveling with the roll of newsprint trailing.

- 29 CFR 1917.27(b)(1): Personnel - Supervisory accident prevention proficiency. "After October 3, 1985 immediate supervisors of more than five (5) persons shall satisfactorily complete a course in accident prevention. Employees newly assigned to supervisory duties after that date shall be required to meet the provisions of this paragraph within ninety (90) days of such assignment."

This accident might have been prevented if the employer had provided accident awareness training to supervisors in accordance with 1917.27(b)(1), including the following topics: safety responsibility and authority, elements of accident prevention, and recognition of longshoring hazards.

Other Relevant Standards and/or Control Measures

Clearly marked travel aisles should be established in the warehouse for forklift traffic and pedestrians must remain outside of these designated vehicle travel aisles.

Workers should not be inside or adjacent to containers as they are being loaded with cargo.

VEHICULAR ACCIDENTS

Summary No. 10 - Forklift Truck Operations

Hazard
Employees were exposed to the hazard of being struck by a forklift truck with an obstructed forward view.

Process
A forklift truck transfers paper rolls from a cargo vessel to a pier shed (warehouse).

Activity at time of incident:
The forklift operator was driving through the doorway of the pier shed while another employee was standing in the doorway.

Incident Description
Setting:
Longshoremen are transferring paper rolls from a cargo vessel to a pier shed, using a crane and forklift trucks. The paper rolls, which are each approximately 50 inches in diameter and weigh about 1,500 pounds, are lifted out of the vessel and placed on the pier by an on-board crane. The rolls are then picked up and carried by the forklift with a front clamp attachment. Each load consists of six rolls, stacked in two side-by-side columns of three rolls. There are two gangs performing the unloading operation, each consisting of 11 employees (4 piermen, 4 holdmen, 1 deckman, 1 crane operator, and a gang carrier). After the forklift drivers pick up the paper rolls, they back down the pier, pass the shed door, then drive forward a few feet and turn right through the door into the shed, and place the rolls on the floor for the longshoremen to pick up and distribute in the shed. The shed door is 20 feet wide and the pier apron is 36 feet wide.

Incident:
At the time of the incident, the gang carrier (the victim) was standing near the center of the doorway of the shed, as the driver turned right into the shed doorway. The left front side of the forklift struck the gang carrier and killed him.

Relevant Factors:
Despite training, the forklift driver failed to slow down and sound the horn as he turned the vehicle through the doorway of the shed. Several employees observed the incident and shouted at the forklift driver to stop. However, the forklift driver could not hear them over the noise at the site.

A video camera mounted on the right side frame of the forklift truck, intended to provide a clear line of sight for the operator to engage/disengage the load, was inoperative.

Applicable Standards and Control Measures

? 29 CFR 1917.43(b)(8): Powered industrial trucks - General. "The employer shall direct drivers to slow down and sound the horn at crossaisles and other locations where visibility is obstructed."

This hazard might have been prevented if the employer had ensured that forklift drivers always slowed down and sounded the horn before turning into the pier shed. Additionally, the employer should have evaluated the paper roll unloading operation and the associated traffic patterns. This hazard may have been prevented if the employer had established designated pedestrian and vehicle lanes, one way traffic flow, and had ensured that there were visible and audible devices to warn pedestrians of approaching traffic.

Workers should not be permitted to stand in door openings in active cargo transit areas.

VEHICULAR ACCIDENTS

Summary No. 11 - Forklift Truck Operations

Hazard
Employees were exposed to the hazard of being struck by a lift truck with damaged safety devices and impaired operator visibility.

Process
A lift truck with a front-end attachment is used to load rolls of coiled steel onto a flatbed trailer.

Activity at time of incident:
Two employees were standing near a lift truck when the operator of the lift truck placed a load of coiled steel rolls on the flatbed trailer and began backing up.

Incident Description
Setting:
A longshoreman is operating a lift truck equipped with a front-end attachment to transport rolls of coiled steel from a storage area to a flatbed trailer at a longshoring terminal. The operator is assisted by a checker. As the loading operation is almost finished, the facility's assistant operations manager arrives at the site and walks to a location within 50 feet of the rear corner of the lift truck (on the driver's side). He motions to the checker, who walks towards him, passing behind the rear of the lift truck. Both employees then stand with their backs to the lift truck, in an area bordered by stored rolls of coiled steel. Meanwhile, the lift truck operator, who has just finished placing a roll of coiled steel on the flatbed trailer, backs up from the flatbed trailer at an angle towards the lift truck operator's left.

Incident:
While backing up away from the flatbed trailer, the lift truck operator failed to see the two employees standing at the rear of the truck. The vehicle first struck the assistant manager in the back (pushing him to the side), and then struck the checker, apparently with the driver's side rear tire. After being knocked to the ground, the checker was caught under the lift truck, dragged, and killed. The assistant operations manager had unsuccessfully attempted to grab the checker, then ran to the front of the lift truck and yelled for the operator to stop the vehicle. However, by that time the lift truck had driven over checker's body.

Relevant Factors:
The driver's side cab window and both rearview mirrors on the lift truck were damaged. Instead of replacing the broken window, the employer installed a piece of cardboard over the broken section. The right rearview mirror was missing altogether, and the left rearview mirror mount was bent, causing the mirror's view to be blocked by a post on the cab. There was evidence of rust in the bent portions of the right side mirror as well indicating the damage was not recent. For the operator to see the area he was backing into, he would need to look out the cab door, which would have required him to get out of his seat.

The assistant operations manager claimed that he and the victim were standing at a distance of about 50 feet from the lift truck, stating that he could see the operator through the left side door of the lift truck cab and presumed that the operator could see them. The lift truck operator disputed the location of these employees, stating that they were standing just off to the left rear of the lift truck in his blind spot.

The lift truck's audible backup alarm was in proper working order. The assistant operations manager heard the lift truck's alarm but failed to move in response to it. He stated that after hearing the backup alarm all day long, he became unconcerned about its warnings.

The lift truck operator was the only employee who operated the lift truck involved in the incident. He had worked for the employer for nine years and operated the lift truck daily. The operator had not been instructed to perform pre-operation inspections of the lift truck nor did he report the defects to anyone. After the incident, the employer returned the lift truck to service without repairing the damaged rearview mirrors or window.

Applicable Standards and Control Measures

- 29 CFR 1917.43(c)(5): Powered industrial trucks - Maintenance. "Powered industrial trucks shall be maintained in safe working order. Safety devices shall not be removed or made inoperative . . . Trucks with . . . a safety defect shall not be operated."

This hazard might have been prevented by repairing or replacing the damaged rearview mirrors and the broken window in the lift truck cab, thus providing the operator with a clear view to the rear. This hazard could also have been prevented by conducting routine inspections of the lift truck before each use, maintaining the equipment in safe working condition, and immediately taking it out of service when defects made it unsafe to operate.

Other Relevant Standards and/or Control Measures

- 29 CFR 1917.1: refers to 1910.178(l) Powered industrial truck - Operator training. "The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely as demonstrated by the successful completion of the training and evaluation specified in this paragraph."

The lift truck operator, through initial and periodic refresher training, must observe all safe operating procedures. Additionally, safe access routes and work areas should be established for employees who must pass through or work in areas where lift trucks are operating.

Employees on foot would be more visible to vehicle operators if they were wearing high visibility vests and if strobe lights were placed on the lift truck.

VEHICULAR ACCIDENTS

Summary No. 12 - Forklift Truck Operations

Hazard
Employees were exposed to the hazard of being struck by a forklift truck operating in a location not restricted to vehicular traffic.

Process
A forklift truck transfers steel coils from a dock to a marine terminal warehouse.

Activity at time of incident:
A warehouse employee walked among stacks of steel coils when he stepped into the path of a forklift truck as it backed up.

Incident Description
Setting:
Longshoremen are transferring steel coils from a dock to a marine terminal warehouse, using a forklift truck and a bridge crane to stack the coils in rows in the warehouse. The forklift operator would carry as many as two of the coils (weighing about 19,000 pounds each and measuring about 42.5 inches in diameter) at one time from the barge to the warehouse. The warehouse is 60 feet wide and 500 feet long. In the warehouse there is one well-defined main aisle of fixed length and width (about 18.5 feet wide), but the other aisles vary in width and length, depending on the number of coils in storage at any given time. The forklift truck, which is about 30 feet long and 9 feet wide, enters the warehouse through a roll-up door (about 18.5 feet wide), places the coils in a clear area of the warehouse, backs up across the main aisle into another clear area, and exits through the same door. The forklift operator usually carries two coils at a time on the lift truck. The warehouse employee operates an overhead (bridge) crane inside the warehouse to stack the coils after they are delivered by the forklift truck. No aisles within the warehouse are marked or designated.

Incident:
Just before the incident, a steel coil apparently slipped off the crane hook used to transport the coils throughout the warehouse, and the warehouse employee had left the bridge crane pendant control station to investigate the situation. It appears that the coil on the hook struck another stacked coil and fell from its hook. The employee walked among the stacks into an area used by the forklift truck operator to turn around, stepping into the path of the forklift truck as it backed up. The operator lost sight of the warehouse employee as he was turning around. The vehicle struck and killed the employee.

Relevant Factors:
The warehouse lacked designated safe aisle ways and operating areas for the forklift truck.
There was no designated drop off point for the coils in the warehouse. Moreover, a forklift truck safety manual kept at the work site specified the marking of forklift truck paths.

The forklift truck operator typically did not sound the horn in the warehouse unless he saw unauthorized personnel in the vicinity. However, the reverse signal alarm was operable (and assumed to be in operation at the time of the incident).

Other safety hazards were identified during the investigation. For example, the bridge crane and material handling gear in the warehouse were not properly inspected prior to being placed in service. The brake pedal on the forklift truck did not have a non-slip surface and the forklift truck was not marked with its rated capacity visible to the operator. Hard hats were not required for employees working in the warehouse, although coils were moved at various heights throughout the building. Additionally, emergency exits were not clearly marked, and in some cases the view was obstructed by the stacked steel coils.

Applicable Standards and Control Measures

- 29 CFR 1917.44(f): General rules applicable to vehicles. "Vehicular routes, traffic rules, and parking areas shall be established, identified, and used.."

This hazard could have been prevented by designating and clearly marking travel aisles for the forklift truck in the warehouse and by ensuring that other employees remained outside of these designated vehicular travel aisles, or by posting authorized operating area signs.

Other Relevant Standards and/or Control Measures

Drivers should be instructed not to travel in any direction with an obstructed view unless they have a spotter to guide them through the blind areas.

VEHICULAR ACCIDENTS

Summary No. 13 - Forklift Truck Operations

Hazard
Employees were exposed to the hazard of being struck by the forks attached to a forklift truck with defective safety devices.

Process
A forklift equipped with a trash bucket picks up trash in front of a marine terminal garage.

Activity at time of incident:
Longshoremen were emptying the contents of the trash bucket into a dumpster.

Incident Description
Setting:
Two longshoreman are picking up trash from the parking lot in front of the marine terminal garage. To dispose of the trash, one longshoreman operates the two-ton forklift with a trash bucket suspended from one fork. The trash bucket is attached to the blade on the left side of the fork lift with a nylon strap and shackle. The right blade stays attached to the lift but is empty. The second longshoreman walks alongside the forklift, picking up the trash by hand and placing it into the bucket. The bucket is then dumped into a 6- foot high dumpster located in front of the garage. The forklift operator raises the trash bucket above the dumpster as the other longshoreman tips the trash into the dumpster. This clean-up is done once every few weeks.

Incident:
After the bucket was loaded with light trash (mostly paper), the operator positioned the forklift truck near the dumpster and raised the bucket over the dumpster. At this point the forks were about eight feet above the ground. The other longshoreman was standing beneath the right blade trying to tip the trash bucket on the left blade with a shovel. The forklift operator jostled the bucket up and down to help dump the trash bucket while the longshoreman pushed with the shovel. The right blade became dislodged from the carriage of the forklift and struck the longshoreman in the head and killed him.

Relevant Factors:
The fork truck blade became disengaged from the carriage and fell off when the bucket was jostled up and down. Additionally, the forklift truck had two major deficiencies that may have contributed to the incident. The end stops, which prevent the blades from sliding off the end of the carriage, were broken off and the spring-loaded latch, which keeps the blade secured between the notches of the carriage, was missing. An inspection of forklifts in the shop revealed that all of the forklifts had broken end stops.

Further, the forklift was not equipped with a vertical load backrest extension, as required by 29 CFR 1917.43(e)(2), intended to prevent the load from hitting the mast when the mast is positioned at maximum backward tilt.

There were numerous other safety hazards at this facility, including improper machine guarding, failure to install guardrails, and electrical hazards. Additionally, poor housekeeping was noted (debris was piled up in one area of the garage) and lack of appropriate first aid such as a missing eye wash station.

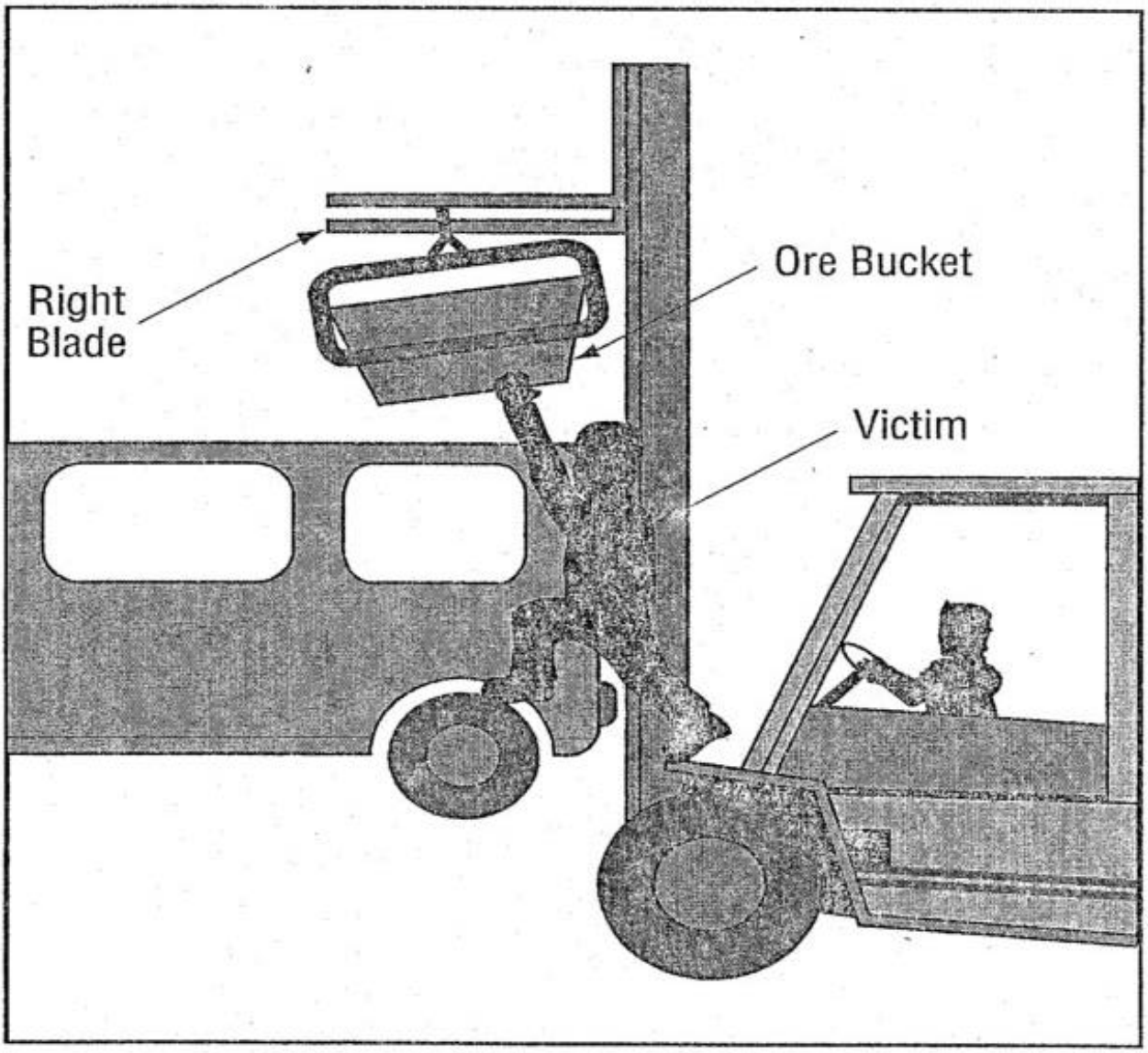
Applicable Standards and Control Measures

- 29 1917.43(c)(5): Powered industrial trucks - Maintenance. "Powered industrial trucks shall be maintained in safe working order. Safety devices shall not be removed or made inoperative . . . Trucks with . . . safety defect(s) shall not be operated."

This hazard might have been prevented if the forklift had been properly maintained and inspected prior to its use and taken out of service until repairs were completed. Specifically, the end stops and spring loaded latches should have been repaired to prevent the forks from becoming dislodged. The blade stops were removed from a fork lift allowing the fork lift blade to be accidentally disengaged.

Other Relevant Standards and/or Control Measures

A different method for tipping the trash bucket should be developed. In addition to the hazard presented by the blades, the trash bucket itself could have become dislodged. For example, a long rod with a hook for tipping the bucket from a distance could be used or alternatively, a different method for transferring the trash into the dumpster that did not involve using the forklift and the trash bucket.


Right
Blade
Ore Bucket
Victim

VEHICULAR ACCIDENTS

Summary No. 14 - Servicing and Maintenance Operations

Hazard
Employees servicing tires were exposed to the hazard of being struck by material released during an exploding wheel separation.

Process
Employees were servicing a flat tire mounted on a multi-piece wheel on a forklift truck.

Activity at time of incident:
An employee was attempting to loosen a tire lock by tapping on it with a ratchet.

Incident Description
Setting:
A 20-ton forklift truck with dual front wheels and single rear wheels is parked in the maintenance shop. The left front inner tire on the forklift is flat, and three employees - the port manager, a crane operator, and a stevedore - are attempting to remove the outer tire to access the inner flat tire.

Incident:
At the time of the incident, the crane operator had removed all but two nuts from the wheel retaining clamps that held the tire lock. All three employees were standing next to the tire. While the outer tire was still pressurized, the crane operator began to tap on the tire lock with a ratchet to get the lock loose. The tire exploded and components of the wheel assembly struck the three employees and threw them approximately 15 feet from the forklift. The impact killed the crane operator and seriously injured the two other employees.

Relevant Factors:
None of the employees were trained in the proper procedures for servicing tires such as the one involved in the incident.

The wheel involved in the incident had numerous safety deficiencies. The tire was overinflated (the tire manufacturer recommended a maximum pressure of 50 psi and a pressure of 70 to 80 psi was maintained in the tires on the forklift), and the side wall of this overinflated tire was severely worn. Additionally, the tire's split rim lock had been damaged during installation and was welded in place in order to seat the rim and tire. Moreover, the wheel flange was badly damaged.

The split rim tires were frequently repaired on site. However, there was no restraining device, such as a cage, rack, or other device capable of withstanding the maximum force that would be transferred to it during an explosive wheel separation. Additionally, the inflation hose was not equipped with a clip-on chuck nor was there sufficient hose to permit an employee to inflate the tire remotely, away from the danger zone.

Applicable Standards and Control Measures

- 29 CFR 1917.44(o)(3)(i): General rules applicable to vehicles - Servicing multi-piece and single piece rim wheels - Employee training. "Only employees trained in the proper procedures for servicing multi-piece rim wheels shall be assigned such duties."

- 29 CFR 1917.44(o)(5)(i): General rules applicable to vehicles - Charts and manuals. "The employer shall provide a chart containing as a minimum the instructions and information provided in the United States Department of Transportation, National Highway Traffic Safety Administration (NHTSA) publication "Safety Precautions for Mounting and Demounting Tube-Type Truck/Bus Tires" and "Multi-Piece Rim Wheel Matching Chart," and pertinent to the type(s) of multi-piece rim wheels being serviced. The chart shall be available in the terminal's service area."

- 29 CFR 1917.44(o)(5)(ii): General rules applicable to vehicles - Charts and manuals. "A current rim manual containing the manufacturer's instructions for mounting, demounting, maintenance and safety precautions relating to the multi-piece rim wheels being serviced shall be available in the terminal's service area."

This hazard could have been prevented if the employer had ensured that the employee did not strike the tire rim or other wheel components while the tire was still inflated. Rather, the tire should have been deflated prior to its removal. Additionally, this hazard could have been prevented if the wheel assembly had been properly inspected and the rim's defective split lock had been replaced. During repair of the split rim tire, a restraining device should have been used. Also a clip-on chuck should have been used during inflation of the split rim wheels. Moreover, the employer should have ensured that only adequately trained employees, with demonstrated ability, be permitted to service the tires on the forklift. Specifically, the employer should have made available the applicable charts and manufacturer's instructions and should have ensured that employees follow the procedures set forth in these documents.

Other Relevant Standards and/or Control Measures

Tires should be inflated to the maximum allowable pressure indicated by the manufacturer. In this case, the tires should never have been inflated to more than 50 psi. Proper training in tire servicing, as described above, should address this very important aspect of tire safety.

SECTION II

FALLS/DROWNING ACCIDENTS

FALLS/DROWNING ACCIDENTS

Summary No. 1 - Releasing Mooring Lines at Dock's Edge

Hazard
Employees were exposed to fall and drowning hazards while releasing a vessel from the dock.

Process
Unmooring a 500-foot vessel from the dock after unloading

Activity at time of incident:
After unloading cargo from the vessel, a longshoreman at the stern end of the dock released the stern mooring lines from the mooring cleats, allowing the vessel to sail. This activity required the longshoreman to work adjacent to the dock's edge.

Incident Description
Setting:
When the vessel loaded with steel arrived at a terminal four longshoreman would tie it to the dock. To perform this task, a seaman would cast a line to the longshoreman on the dock to secure the initial lines to the mooring cleats. The seaman would use a winch to pull the vessel into the dock, after which the longshoreman on the dock would attach spring lines to the mooring cleats to assure that the vessel remains against the dock. The longshoring crew then proceeded to unload the steel from the vessel.

After the crew finished unloading, two longshoremen would remain to "release" the vessel from the dock moorings. This process involved first removing the spring lines and then releasing the bow lines and stern lines from the mooring cleats. The longshoreman were working within one to two feet of the dock's edge. Life rings were made available at the work site.

Incident:
At the time of the incident, one longshoreman (victim) was releasing the line mooring the vessel's stern, while the other longshoreman was releasing the line at the vessel's bow. Neither employee was wearing a life vest. The longshoreman at the stern was positioned at a mooring cleat located right at the edge of the dock, which had a crumbling concrete surface. While removing the line, he lost his footing, slipped from the dock, and fell into the water, according to a security guard who witnessed the incident. After the security guard alerted the longshoreman at the bow, the longshoreman ran the 500-foot length of the vessel to the stern end, and threw a life ring with a rope to the victim. The victim who was thrashing about trying to tread water, made no attempt to grab the life ring and slipped beneath the water's surface. Fire department divers responded and were in the water within five minutes of receiving the report of the incident. The divers located the victim near the point where he entered the water, but the victim had drowned.

Relevant Factors:
The longshoreman was not wearing a life vest while working adjacent to the edge of the dock. Life vests were available but not required to be worn.

Crumbling concrete around the cleat, where the employee was located shortly before he fell into the water posed a slip/trip hazard.

Applicable Standards and Control Measures

- 29 CFR 1917.95(b)(1): Other protective measures - Personal floatation devices (PFDs). "The employer shall provide, and shall direct the wearing of PFDs for those employees, such as line handlers, who are engaged in work in which they may be pulled into the water."

This hazard could have been prevented by providing and enforcing the use of life vests for employees who work in areas where a fall/drowning hazard existed. The life vests must be Coast Guard approved and marked for its appropriate use as a life vest for use on vessels (1917.95(b)(2).)

Other Relevant Standards and/or Control Measures

- 29 CFR 1917.111(a): Maintenance and load limits. "The structural integrity of docks, piers, wharves, terminals and working surfaces shall be maintained."
- 29 CFR 1917.111(d): Maintenance and load limits. "All walking and working surfaces in the terminal area shall be maintained in good repair."

Crumbling concrete should be removed and replaced with solid non-skid walking surfaces.

Additionally, employees should have appropriate work boots with cleated soles for greater traction.

Training in mooring and unmooring vessels is also essential to accident prevention.

FALLS/DROWNING ACCIDENTS

Summary No. 2 - Unhooking Spreader Cables Onboard A Grain Barge

Hazard
Employees were exposed to the hazard of falling into the water and drowning.

Process
A shore-based crane is used to remove barge covers to unload grain from a barge.

Activity at time of incident:
A longshoreman was onboard a grain barge unhooking the crane's spreader cables from a barge cover when he fell into the water.

Incident Description
Setting:
Longshoremen are unloading the grain barge moored at the dock. A crane operator uses a shore-based crane rigged with spreader cables to lift and remove the barge covers prior to unloading the grain. Three longshoremen have boarded the barge and are assisting with the removal of the barge covers.

Incident:
One of the three longshoremen on the barge was unhooking the spreader cables from a barge cover next to an unguarded edge when he lost his balance and fell into the water. The employee was not wearing a personal flotation device, and no life ring was available. He drowned after swimming about 80 feet.

Relevant Factors:
The employees working on the barge were not wearing personal flotation devices. The employer had not provided and did not require any employees to use life vests, and did not make life rings readily available in the vicinity of the employees.

Applicable Standards and Control Measures

- 29 CFR 1918.97(e)(1): First aid and lifesaving facilities - Life-rings. "The employer shall ensure that there is in the vicinity of each vessel being worked at least one U.S. Coast Guard approved 30-inch (76.2 cm) life-ring with no less than 90 feet (27.43 m) of line attached, and at least one portable or permanent ladder that will reach from the top of the apron to the surface of the water."

This hazard could have been prevented if the employer had placed a life ring within easy access of the longshoremen on the barge. The employer should have provided a ladder reaching from the apron to the surface of the water within access of the longshoremen in case they fell into the water.

- 29 CFR 1918.105(b): Other protective measures - Personal flotation devices (PFDs). "The employer shall provide and shall require the wearing of personal flotation devices for each employee engaged in work in which the employee might fall into the water."

This hazard could have been prevented if the employer had required the employee to wear a U.S. Coast Guard-approved life vest whenever working on a barge or in other areas where he could fall into the water.

Other Relevant Standards and/or Control Measures

- 29 CFR 1918.97(c): First aid and lifesaving facilities - First aid kits. "A first aid kit shall be available at or near each vessel being worked. At least one person holding a valid first aid certificate, such as is issued by the Red Cross or other equivalent organization, shall be available to render first aid when work is in progress."

A first-aid kit must be available for the vessel on which work is being performed. At least one employee certified in first aid must be available during vessel operations.

- 29 CFR 1918.97(d)(1): First aid and lifesaving facilities - Stretchers. "For each vessel being worked, at least one Stokes basket stretcher, or its equivalent, shall be available to be permanently equipped with bridles for attachment to the hoisting gear."

At least one Stokes basket stretcher must be provided for the vessel, in accordance with the specifications set forth above.

In grain operations, the barge deck may become slippery when wet and even when dry. Barge workers should be required to wear appropriate work boots, be instructed how to walk in slippery conditions (take short steps) and to use the barge coaming as a hand grab or hand rail when walking on the barge deck. Workers on barges should not work alone. It is best to work in pairs or have another worker watching the work activity.

FALLS/DROWNING ACCIDENTS

Summary No. 3 - Operating A Bobcat On An Open Deck Barge

Hazard
Employees were exposed to the hazard of falling from an unguarded open deck flat top barge and drowning.

Process
A front-end loader and a crane unload gravel from an open deck barge.

Activity at time of incident:
The employee had been operating a front-end loader (Bobcat) on the barge prior to the incident. However, his activities at the time of the incident are not known because there were no eyewitnesses. The front-end loader was not involved in the incident.

Incident Description
Setting:
Longshoremen are unloading gravel from an open deck barge, using a small front-end loader (Bobcat) and an onshore crane. The barge is 200 feet long and has unguarded edges. On the barge, the operator of the bobcat pushes the gravel into piles, which are then picked by the crane operator using a clamshell bucket attachment. The crane operator then places the gravel in a storage area on the dock.

Incident:
The crane operator last saw the bobcat operator returning to the dock after leaving the barge to get fuel for the bobcat. Shortly afterwards, the crane operator stopped unloading gravel for the day and, before leaving the dock, tried unsuccessfully to locate the Bobcat operator. About an hour later, the crane operator was contacted at home and was asked to return to the dock to remove the bobcat from the barge so that the tugboat operator could move the barge. About two hours after he was last seen by the crane operator on the dock, the bobcat operator's body was found in the water near the area used to access the barge. The bobcat operator had apparently fallen (from an unknown location) into the water and drowned.

Relevant Factors:
Although there were no eyewitnesses, it is believed that the Bobcat operator fell off the unguarded open deck barge into the water, which was 11 feet deep at the barge site. The Bobcat operator was not wearing a life vest and could not swim. Although life vests were available at the dock, the employer did not require the employees to wear them while working aboard the unguarded barge. There were no life rings with 90 feet of line attached, available at the site.

The barge was moored close to the dock and the employees reached the barge by stepping from the dock over a one-foot gap between the dock and the barge. A ladder was available to access the barge at low tide.

Applicable Standards and Control Measures

- 29 CFR 1918.65(h)(9): Mechanically powered vehicles used aboard vessels - Operation. "When lift trucks or other mechanically powered vehicles are being operated on open deck-type barges, the edges of the barges shall be guarded by railings, sideboards, timbers, or other means sufficient to prevent vehicles from rolling overboard...."

This hazard might have been prevented by guarding the edges of the barge with railings. Even though this incident occurred when the laborer was not operating the Bobcat, adequately guarded edges may have prevented the employee from falling overboard.

- 29 CFR 1918.105(b)(1): Other protective measures - Personal flotation devices (PFDs). "The employer shall provide and shall require the wearing of personal flotation devices for each employee engaged in work in which the employee might fall into the water."

This hazard might have been prevented if the victim had been required to wear a life vest while working aboard the barge.

- 29 CFR 1918.97(e)(1): First aid and lifesaving facilities - Life-rings. "The employer shall ensure that there is in the vicinity of each vessel being worked at least one U.S. Coast Guard approved 30-inch (76.2 cm) life-ring with no less than 90 feet (27.43 m) of line attached, and at least one portable or permanent ladder that will reach from the top of the apron to the surface of the water."

If someone had noticed the bobcat operator falling into the water, and if a 30-inch life-ring with at least 90 feet of line attached had been placed in an easily accessible location near the barge, this hazard may have been prevented. This hazard was abated by providing 2 life rings with 90 feet of line on each. A large sign was posted on the building that reads, "Life Ring Inside" with two arrows pointing in the direction of the doorway.

- Longshoremen should receive awareness training in longshoring hazards, including drowning hazards and drowning prevention.

Other Relevant Standards and/or Control Measures

- 29 CFR 1917.45(i)(2): Cranes and derricks - Operations - Guarding of swing radius. "Accessible areas within the swing radius of the body of a revolving crane shall be physically guarded during operations to prevent an employee from being caught between the body of the crane and any fixed structure or between parts of the crane."

This hazard *was* abated by placing four *(30)* inch high orange traffic cones with a yellow rope connecting them to form a barricade. This barricade was placed approximately 6 ft from the counter weight of the crane and is portable.

- 29 CFR 1917.50 (b)(1): Certification of marine terminal material handling devices. "In accordance with part 1919 of this chapter, by persons then currently accredited by the Occupational Safety and Health Administration as provided in that part;)

The crane had not been certificated in accordance with the standards of part 1919 by persons accredited by OSHA. This hazard was abated by testing the crane and certifying it by an accredited service.

FALLS/DROWNING ACCIDENTS

Summary No. 4 - Working Aboard A Barge Or Tugboat

Hazard
Employees working aboard barges and tugboats were exposed to the hazard of drowning.

Process
A crane barge and a tugboat were moored at a dock in preparation for towing.

Activity at time of incident:
The deckhand/watchman was apparently aboard either a crane barge or the adjacent tugboat when he fell overboard.

Incident Description
Setting:
A crane barge and tugboat are moored alongside a dock at a gravel yard. A single employee works the night shift (7 p.m. to 7 a.m.) as the deckhand/watchman for the barge and tugboat.

Incident:
The deckhand/watchman apparently fell from either the barge or the tugboat and drowned. His body was later found in a different location on the river. There were no eye witnesses to the incident.

Relevant Factors:
The victim was not wearing a life vest at the time his body was discovered three weeks after he disappeared. He was found to be wearing penny loafers, which do not provide appropriate protection for work aboard vessels. Additionally, the victim was believed to be drunk at the time of the incident. The autopsy report indicated that acute alcohol intoxication was a "contributory factor" in the drowning based on a finding of a blood alcohol level of 0.12 percent.

The employer failed to ensure that employees wore life vests when working in locations presenting drowning hazards. The employer also failed to perform safety inspections to ensure that employees routinely wore the required personal protective equipment.

Numerous safety hazards were present at the site. Of the 11 personal flotation devices on site, 9 were defective. Some of the life vests were torn and many had broken straps. One life ring was frayed and worn, and of the required 90 feet of line only 40 ft of line was attached to either of the two available life rings. There was no blanket or other suitable covering available for emergency procedures within the barge area, but there was a stretcher on the barge. The employer did not ensure that all employees exposed to impact, falling objects, or punctures were wearing safety shoes. No employee was trained in first aid and the first aid kit was inadequately stocked. An aluminum rescue boat on the barge had holes

in the bottom that could cause the boat to leak and sink. The generator on the crane barge was inadequately guarded. Two ladders used for climbing in and out of the barges were in poor condition (bent bottom step and cracked side rails) and should have been taken out of service. Deficiencies in hazard communication training and material safety data sheets were also found. Poor housekeeping, indicated by piles of rags littering the tugboat's generator room and saturated with motor oil, was noted.

Applicable Standards and Control Measures

? 29 CFR 1918.105(b)(1): Other protective measures - Personal flotation devices (PFDs). "The employer shall provide and require the wearing of PFDs for each employee engaged in work in which the employee might fall into the water."

? 29 CFR 1918.105(b)(3): Other protective measures - Personal flotation devices (PFDs). "Personal flotation devices shall be maintained in safe condition and shall be considered unserviceable when damaged in a manner that affects buoyancy or fastening capability."

Although there were no witnesses to the incident, this fatality may have been prevented if the employer had required and ensured the use of life vests by all employees exposed to drowning hazards. Additionally, the hazard could have been prevented if the employer had performed random safety checks of the night watchman to ensure that he was routinely wearing a life vest in good condition.

Other Relevant Standards and/or Control Measures

A written safety program should be implemented which includes: hazards assessments; a hazardous communication program; safety training meetings; first aid training; requirements for PPE; and the monitoring of employee performance or work habits at the barge unloading area.

Additionally, when employees are working alone in an isolated location, frequent checks should be made to ensure the safety of the employees. Another person on duty such as a fleet mate, tugboat captain or another deckhand should know the whereabouts of a crew member working in isolation.

FALLS/DROWNING ACCIDENTS

Summary No. 5 - Egress From A Tramper Vessel

Hazard
Employees were exposed to the hazard of falling while using a single rope rung Jacob's ladder that did not meet OSHA requirements for treads and stability.

Process
Longshoremen load boxes of frozen fish into the hold of a tramper vessel.

Activity at time of incident:
A longshoreman was climbing down a rope rung Jacob's ladder leading from the stern of a tramper vessel to the deck of a waiting tugboat.

Incident Description
Setting:
A crew consisting of a gang boss, eight longshoremen, a winch operator (all from the local longshoremen's union), and a supervisor from the stevedoring company, are aboard a tramper vessel located in a harbor. Two catcher/processor vessels are rafted to the sides of the tramper. The crew spends the work shift loading crates of frozen fish into the hold of the tramper, and after completing a 10-hour shift, three longshoremen are preparing to take the tugboat back to the shore. Workers normally exit the tramper from a Jacob's ladder placed over one side of the vessel. However, there are fishing vessels along both sides of the tramper, thus the Jacob's ladder, a single rope rung type, is hung off the stern instead, descending about 20 feet to the deck of the tug's bow. The ladder is not secured at the bottom, and a deck hand aboard the tugboat is attempting to hold the bottom of the ladder in place. Strong winds and high waves are rocking the vessels, making it nearly impossible to hold the ladder steady.

Incident:
At the time of the incident, the first of the three crew members had descended the ladder onto the deck of the tugboat. The second crew member (the victim) was attempting to descend the Jacob's ladder, but after climbing down about four rungs (about 5 feet), the longshoreman froze, began shaking, and indicated that he did not think he could continue. Another longshoreman was attempting to talk him through the descent as the victim fell backwards off the rope ladder. The victim died after falling about 15 feet from the ladder to the tugboat deck and striking his head on the metal housing of the tugboat's wheelhouse.

Relevant Factors:
The rope rung Jacob's ladder did not have any wooden steps or stabilizers and was not a double rung ladder.

Applicable Standards and Control Measures

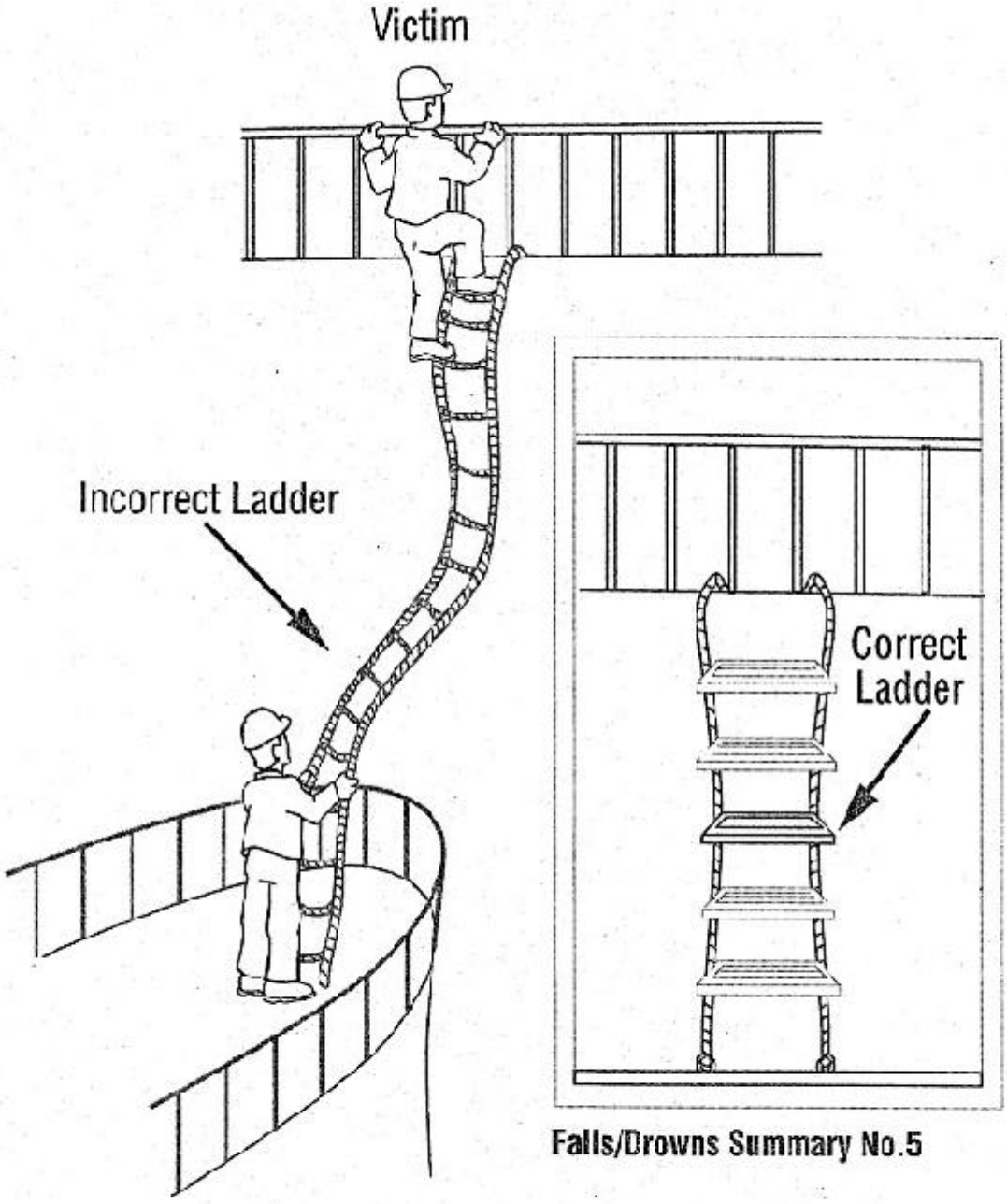
- 29 CFR 1918.23(a): Jacob's ladders. "Jacob's ladders shall be of the double rung or flat tread type. They shall be well maintained and properly secured."

This hazard might have been prevented if the employer had ensured that employees used only a Jacob's ladder meeting OSHA requirements, such as a double rung ladder or a ladder with wooden steps or stabilizers, and that employees properly secured the Jacob's ladder before using it. (The exact cause of the victim's actions is not known, but the victim may not have panicked if the ladder had been secured and more stable.)

Other Relevant Standards and/or Control Measures

Supervisors should be trained to recognize unsafe practices, and should have the authority to make on-the-spot decisions to correct safety violations.

New employees should receive training on shipboard safety, including hands-on training in the use of properly designed Jacob's ladders, before working aboard vessels.



Falls/Drowns Summary No.5

Incident Description: Victim fell off rope rung ladder while attempting to descend.

FALLS/DROWNING ACCIDENTS

Summary No. 6 - Front End Loader Operating On An Open Deck Barge

Hazard

Employees were exposed to the hazard of rolling overboard and drowning while operating a front-end loader on an unguarded open deck barge.

Process

Employees unload sand from an open deck barge into a hopper on an adjacent barge using a crane and front end loader.

Activity at time of incident:

A front-end loader operator had finished unloading a sand barge and was on the barge backing up toward the stern.

Incident Description

Setting:

Longshoremen are transferring sand from an open deck barge into a hopper on an adjacent barge, using a front-end loader to push the sand into piles, and using a crane to load the piles into the hopper. The two barges are secured together by cables. The cable is pulled by a winch and moves the barge along the dockside to center its load in front of the hopper where the sand is loaded by crane. A vehicle access ramp leads between the two barges and a second ramp leads from the machine barge (the barge with the hopper) to shore. The open sand barge deck is 195 feet long and 35 feet wide. The barge's surface is about 8 feet above the river, and the river is about 35 feet deep at this point. A sand barrier is in place about 25 feet from the ends of the sand barge to alert equipment operators that they are approaching the edge.

Incident:

The longshoremen had just completed unloading the sand barge and were waiting for a cable to be changed before starting to unload another sand barge. The supervisor had left the barge to retrieve the cable, instructing the front-end loader operator to remain on the empty barge until he returned. The front-end loader operator, who was positioned near the bow of the sand barge, began slowly backing up towards the stern. Three crew members standing on the ramp between the machine barge and the sand barge thought the operator was coming towards them to join them. But rather than stopping once he reached the ramp, the front-end loader operator continued to back up, rolling over the sand barrier about 25 feet from the edge and traveling a total of 127 feet along the barge deck. By the time the operator looked behind him, it was too late to stop the vehicle as the two rear wheels were rolling off the barge. The right rear wheel caught on a steel cable attached to the barge, causing the front-end loader to tilt to the left and fall into the river on its left side. The operator, who was still inside the cab as the front-end loader entered the water, was assumed to have died by drowning. His body was not recovered.

Relevant Factors:
Employees who witnessed the event were not able to explain why the front-end loader operator backed off the end of the barge. They believe that he lost his orientation or was distracted. As the front-end loader approached the edge, one crew member began yelling and waving the operator away from the edge. However, the victim apparently misunderstood the communication, since he smiled and continued to back up. There was no sufficient means to alert him of the nearing edge.

The sand barrier that had been in place approximately 25 feet from the ends of the deck was not effective in preventing the loader from backing through it.

The operator was not wearing a life jacket but had one with him in the cab.

The front-end loader was reportedly in good mechanical condition at the time of the incident.

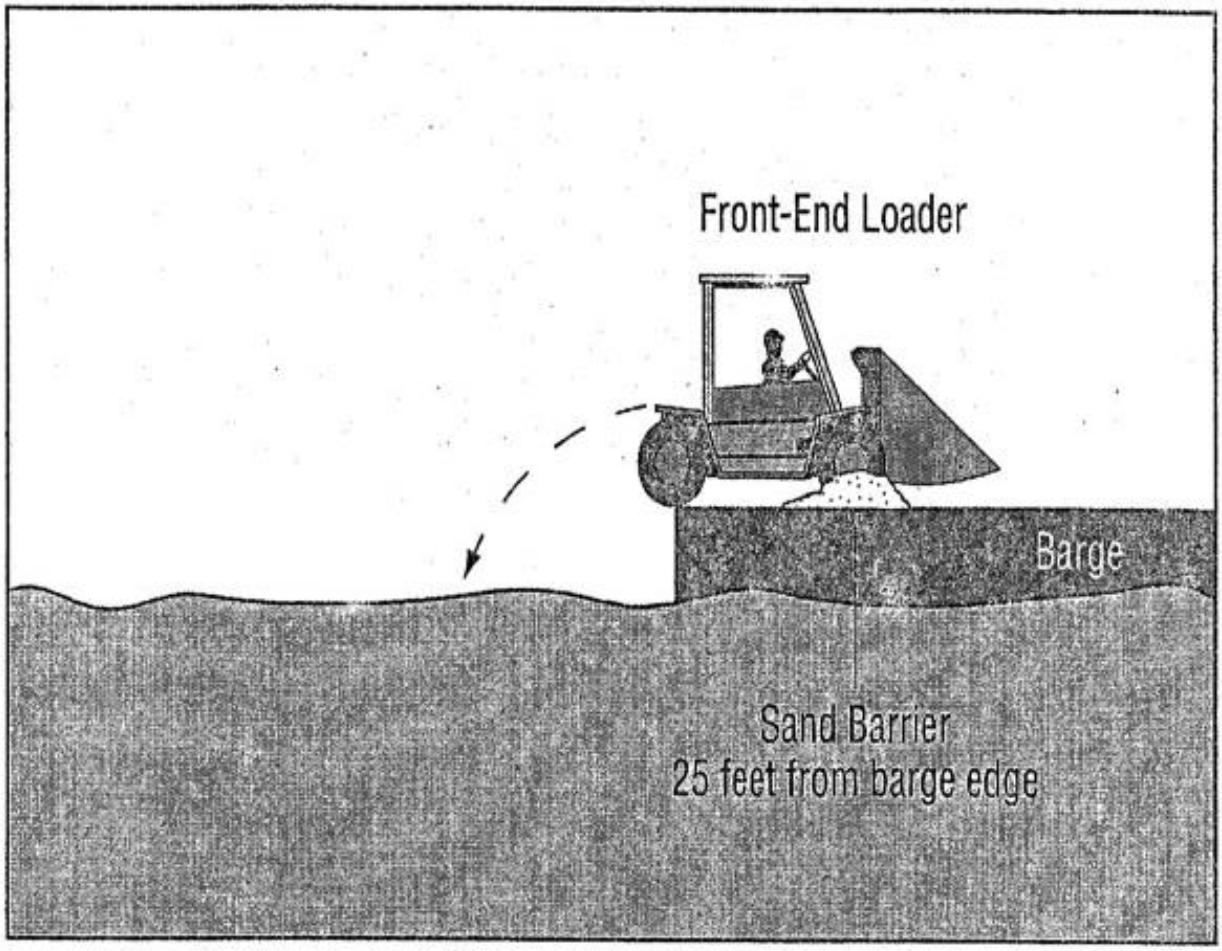
Applicable Standards and Control Measures

- 29 CFR 1918.65(h)(9): Mechanically powered vehicles used aboard vessels - Operation. "When lift trucks or other mechanically powered vehicles are being operated on open deck type barges, the edges of the barges shall be guarded by railings, sideboards, timbers, or other means sufficient to prevent vehicles from rolling overboard."

This hazard could have been prevented if the employer had installed railings along the edges of the open deck to prevent the front-end loader from rolling overboard.

Other Relevant Standards and/or Control Measures

- Operators of machinery such as front-end loaders must be properly trained regarding the hazards and safe work practices for operating the machinery on an open barge in accordance with 29 CFR 1918.98(a)(1).



Falls/Drowns Summary No.6

Incident Description: The front-end loader operator accidentally backed off the barge and drowned. The barge edge had been improperly guarded with a sand barrier.

FALLS/DROWNING ACCIDENTS

Summary No. 7 - Accessing Barge From Floating Dock

Hazard
Employees climbing onto a barge from a floating dock were exposed to the hazard of falling into the water and being crushed by the barge.

Process
Longshoremen unload scrap steel from a barge using a front-end loader, a dump truck, and a crane.

Activity at time of incident:
Longshoremen were releasing the barge's mooring lines so that it could be repositioned to finish unloading.

Incident Description
Setting:
Longshoremen are unloading scrap steel from a barge, which is moored to a floating dock. The crew consists of a crane operator, two dump truck drivers, who are working on the floating dock, and a front-end loader operator aboard the barge. A laborer comes to the dock to refuel the crane. The floating dock has two ramps leading to the shore. It has 3-foot high concrete barricades at each end used as a truck stop in order to prevent the dump trucks from backing off the loading side of the dock into the water.

The front-end loader aboard the barge moves scrap steel to a location where it is then picked up by the crane, which is located aboard the adjacent floating dock. The crane is equipped with a hydraulic grapple, which picks up a load of scrap steel and places it into a dump truck, also located on the floating dock. After the truck is loaded, the truck driver drives on the ramp to the shore and transports the scrap steel to the steel mill approximately one mile away.

Incident:
At the time of the incident, there were four employees on the floating dock, including the crane operator, two truck drivers, and a laborer who was refueling the crane. The workers had unloaded most of the barge and were attempting to reposition it in order to finish unloading the scrap steel

The two dump truck drivers were instructed by the crane operator to leave their trucks and to release the mooring lines so that the barge could be moved forward along the dock. One driver went towards the bow of the barge to loosen the rope and the other went towards the stern. The driver at the stern (victim) attempted to mount the barge by climbing up on one of the concrete barricades on the floating dock and reaching out to the barge. As she attempted to pull herself onto the barge, the barge's stern began to drift away from the dock creating a gap between the barge and the dock. This movement forced her into a prone position (with her hands on the barge and her feet on the dock). The laborer,

who was nearby, attempted to grab the victim by her clothing, but was unable to hold on and she fell head first into the water.
The victim, who was wearing a personal flotation device, held onto the dock's horizontal timbers, but before a rescue could be accomplished, the barge drifted back towards the dock, pinning the victim's upper body between the dock's timbers and the side of the barge. The crane operator used the crane's hydraulic grapple to move and hold the barge away from the dock so the victim could be removed from the water. However, she died as a result of being crushed by the barge.

Relevant Factors:
The employer failed to provide a safe means of access to the barge from the floating dock.

The victim was employed as a locomotive engineer and truck driver. The task she was performing at the time of the accident was not one of her regularly assigned duties. She was not a skilled maritime worker. The employees received insufficient training in marine terminal operations about five months before the incident occurred.

The floating dock was found to be in good condition, with solidly constructed vehicular ramps and guardrails. Personal flotation devices were provided to employees and they were worn routinely. Two 30-inch life rings with rope attached and a stretcher were available on the dock.

The supervisor was operating the front-end loader aboard the barge at the time of the incident. He was unable to get out of the barge because the ladder had been removed to prevent it from being damaged by the front-end loader. After several minutes, he raised the bucket on the loader, climbed up the loader to the top of the barge, and returned to the dock. This was the only ladder available at the site.

Applicable Standards and Control Measures

- 29 CFR 1918.22(a): Gangways. "Whenever practicable, a gangway of not less than 20 inches (.51 m) in width, of adequate strength, maintained in safe repair and safely secured shall be used. If a gangway is not practicable, a straight ladder meeting the requirements of 1918.24 that extends at least 36 inches (.91 m) above the upper landing surface and is secured against shifting or slipping shall be provided. When conditions are such that neither a gangway nor straight ladder can be used, a Jacob's ladder meeting the requirements of 1918.23 may be used."

This hazard could have been prevented if the employer had provided a safe means of accessing the barge. For example, a ramp or walkway could have been installed, meeting the gangway specifications set forth above in 1918.22(a). Alternatively, a straight ladder (designed and installed in accordance with 1918.24) could have been used. As a last resort, if there are no other means available, a Jacob's ladder (in accordance with 1918.23) could be used for this operation.

Additionally, the employer should have developed and implemented a program setting forth safe work practices and procedures at the marine terminal, and the employers should have trained employees (including truck drivers working on barges) regarding proper procedures for entering and exiting barges.

FALLS/DROWNING ACCIDENTS

Summary No. 8 - Operating Alone On Catwalk In Barge Hold

Hazard
Employees were exposed to slip, trip, and fall hazards while working alone in the barge hold of a bulk cement carrier barge.

Process
An air pressure system is used to transfer bulk cement product from a barge to on-shore storage silos through pipes.

Activity at time of incident:
The employee was walking on a catwalk in the barge hold, operating an aeration system by opening and closing air valves to facilitate movement of the bulk cement from the barge to the nearby terminal. The employee was working alone in the hold.

Incident Description
Setting:
Longshoremen are offloading bulk cement from a barge to nearby on-shore storage silos, using pressurized air to transfer the cement through piping. The bulk cement product is then unloaded from the storage silos for shipment by rail and truck. One employee is assigned the task of entering the cargo compartment of the barge to operate the air valves and to monitor the transfer of the bulk cement from the barge. This employee typically notifies another employee, the topside man, when he is entering the barge hold. To operate the controls in the hold, the employee stands on a steel-grate catwalk, which is about 24 inches wide. The employee remains inside the cargo compartment alone for up to an hour.

Incident:
The employee responsible for operating the air pressure valves had entered the barge hold and was walking on the catwalk adjacent to the controls, when he apparently fell and struck his head. There were no eyewitnesses to the incident. About two hours after he had entered the hold, a co-worker checking on the operations in the hold found the employee lying face down on the catwalk, with a gash in his head. The employee died from a skull fracture.

Relevant Factors:
Although the employee typically notified the topside man when he was entering the barge hold, the employer had not established procedures for frequent monitoring to ensure the safety of employees working alone in the holds.

It could not be determined what caused the employee to trip and fall. The catwalk was found to be in good condition and free of obstructions, and there were no reported safety problems in that area. The victim may have struck his head on the catwalk or a nearby guardrail when he fell.

Applicable Standards and Control Measures

- 29 CFR 1918.83(c): Stowed cargo; tiering and breaking down. "Employees trimming bulk cargo shall be checked in and out by the job boss. . . . Frequent checks shall be made to ensure the safety of any employee working alone in a tank or cargo compartment."

This hazard might have been prevented if the employer had established procedures for frequent monitoring of employees working alone in the cargo compartment. Although the exact time of death could not be determined in this case, the injured employee may have survived if he had been discovered sooner and had received prompt medical treatment.

Other Relevant Standards and/or Control Measures

- Evaluate walking and working surfaces in barge holds to ensure there are no slip, trip, or fall hazards.

- Wherever possible, employees should work in pairs when working in barge holds and other isolated areas. In any case, employee(s) working in isolated areas of vessels should maintain some means of communication (e.g., radio, sound powered phones, frequent checks) with topside workers.

FALLS/DROWNING ACCIDENTS

Summary No. 9 - Catwalk Collapse in Warehouse

Hazard
Employees were exposed to the hazard of falling through a catwalk that was structurally unsound.

Process
A bulk conveyor system is used to transfer fertilizer from barges to a warehouse.

Activity at time of incident:
A warehouse employee was standing on the catwalk inside the warehouse, about 35 feet above the concrete floor, making adjustments to the "tripper" on the conveyor.

Incident Description
Setting:
Two warehouse employees are working on a bulk conveyor at a maritime facility that ships a variety of fertilizers and other bulk products. The conveyor is used to transfer fertilizer from a barge to the warehouse. The employees are preparing the conveyor product belt for the unloading operation, and are in the process of relocating the "tripper" device to a different location. The "tripper" is a part of the belt system that forces product off the belt, dumping it into the bin below. The employees access the tripper from a catwalk, which runs along the ceiling of the warehouse about 35 feet above the concrete floor.

Incident:
At the time of the incident, one of the two employees left the catwalk and was on the ground controlling power to the belt. The other employee remained on the catwalk and was attempting to jog the tripper into its final position when the floor of the catwalk collapsed beneath him. He died after falling through the floor of the catwalk, striking the concrete floor 35 feet below.

Relevant Factors:
The incident occurred because of severe corrosion to the catwalk. The catwalk had previously shown significant signs of failure, including bending and breaking, in the exact location as the failure leading to the fatality. Other sections of the walkway had either fallen out or given way for at least two years prior to the incident. An analysis of the broken section of the catwalk indicated that the structure was entirely composed of corrosion products. In addition to the corrosion of the catwalk, some sections of the building were found to be in imminent danger of collapse.

Other safety hazards were noted at the facility which included operating heavy equipment with defective brakes, employee exposure to impact from moving railcars, operating a crane without training in hand signals, and unguarded belt drives. The employer also assigned workers to make repairs to a structurally unsound roof without providing the workers with adequate fall protection. Furthermore,

there were no guardrails on the walkway leading to the catwalk from the railcar loading area. The walkway crossed over a conveyor and exposed workers to falls of more than 16 feet.

Applicable Standards and Control Measures

- 29 CFR 1917.111(d): Maintenance and load limits. "All walking and working surfaces in the terminal area shall be maintained in good repair."

This hazard could have been prevented if the employer had ensured that the catwalk was structurally sound and capable of supporting its design loading. In addition, the employer should have conducted routine inspections of the catwalk, including welds and bracing members. The employer should have repaired or replaced the defective sections, and should have prevented access to the walkway until proper inspections and repairs could be completed.

Employees should have been trained to be aware of the hazards of catwalks, especially in the presence of corrosive materials, to observe catwalk conditions, and to report any defects to management immediately.

The corrosive action of fertilizers on surrounding structures is a recognized hazard in this industry. Standard engineering practice is to design the structures storing such materials out of corrosion-resistant materials such as concrete and fiberglass.

Other Relevant Standards and/or Control Measures

- 29 CFR 1917.112(b)(1): Guarding of edges - Employee protection. "Guardrails shall be provided at locations where employees are exposed to floor or wall openings or waterside edges, including bridges or gangway-like structures leading to pilings or vessel mooring or berthing installations, which present a hazard of falling more than 4 feet (1.22 m) or into the water, except as specified in paragraph (b)(2) of this section."

- 29 CFR 1917.48(a)(2): Conveyors - Guards. "An elevated walkway with guardrail or equivalent means of protection shall be provided where employees cross over moving conveyors, and suitable guarding shall be provided when employees pass under moving conveyors."

There were no guardrails on the walkway leading to the catwalk from the railcar loading area. The walkway crossed over a conveyor and exposed workers to falls of more than 16 feet. Although corrosion of the catwalk was the primary cause of the fatality, the lack of guardrails also exposed employees to a fall hazard. Installing guardrails on the walkway leading to the catwalk, in accordance with the above standards could prevent these accidents.

FALLS/DROWNING ACCIDENTS

Summary No. 10 - Damaged Roof In Warehouse

Hazard
Employees were exposed to the hazard of falling through a damaged roof.

Process
A longshoreman was removing spilled dry material from underneath a material transfer chute on a roof.

Activity at time of incident:
A maintenance worker was walking on a roof surface to access a material transfer chute to clean underneath it.

Incident Description
Setting:
Two scalehouses, connected to a marine terminal warehouse, are each equipped with a chute-conveyor system used for transferring dry bulk material, such as fertilizer and salt. The scalehouses are located at opposite ends of the warehouse, and the chutes are housed within each scalehouse at roof level. During transfer operations, some dry material occasionally spills out of openings in the chutes, and once every two or three weeks, a maintenance employee climbs up to the chutes to remove the spilled material and manually shovel it back into the chutes. The employee typically uses a ladder to access one scalehouse chute, then walks across the warehouse roof to access the other scalehouse chute. The warehouse roof is nearly flat, with a pitch less than 2.5 degrees.

Incident:
On the day of the incident, a maintenance employee had finished cleaning around one of the scalehouse chutes and was walking along the warehouse roof towards the other scalehouse chute when the warehouse roof caved in. The employee had stepped on a weakened section of the roof and died after falling 20 feet to the concrete floor below.

Relevant Factors:
The employer had a contract in place to repair the roof's leaks. Until the repair work was done, employees should not have been working on the roof. As a temporary measure, the employee should have worked on the first chute and then moved the ladder to the other side of the warehouse to gain access to the second chute rather than walk across the damaged warehouse roof to move between the two chutes.

Note: Although the use of a ladder to access both chutes would have been an acceptable temporary control measure until roof repairs were made, it is not a recommended long-term solution because it increases the employee's exposure to fall hazards by doubling the amount of time the employee spends on the ladder. The safer method of gaining access to the second chute is to walk across the broad, flat, structurally sound roof at a safe distance from the roof edge.

Applicable Standards and Control Measures

- 29 CFR 1917.111(a): Maintenance and load limits. "The structural integrity of docks, piers, wharves, terminals and working surfaces shall be maintained."

This hazard could be prevented if the employer had prohibited the employee from walking on the roof until repairs to the weakened section of the roof were completed. Additionally, the hazard could have been prevented if the employer had periodically inspected the roof to ensure that it was in good condition and capable of supporting the weight of the activities performed on its surface.

FALLS/DROWNING ACCIDENTS

Summary No. 11 - Walking On Top Of Stacked Containers

Hazard
Topmen removing twist locks from intermodal shipping containers were exposed to the hazard of falling from the top of the stacked containers.

Process
Longshoremen are offloading intermodal shipping containers from a vessel.

Activity at time of incident:
An employee atop a 34-foot high stack of containers was attempting to step on a crane spreader bar to reach a safety cage, when the crane operator suddenly pulled the spreader bar away from the edge of the container. NOTE: This accident predated the new standards for container top safety.

Incident Description
Setting:
Longshoremen are offloading intermodal shipping containers from a vessel moored to a pier. The containers are each 8 feet wide, 8.5 feet high, either 20 or 40 feet long, and are stacked atop one another in groups of three or four on the vessel. The topmen remove the twist locks on the containers and then it is transported to the pier by a portal crane that travels on rails along the edge of the pier. To release the containers, the topmen are carried to the top of a stack of containers via a safety cage connected to the portal crane's spreader bar, where they remove cones and twist-locks on top of the containers. The topmen are then transported via the safety cage to another location while the crane operator offloads the released containers. A gangway man on the vessel oversees the offloading operation.

Incident:
At the time of the incident, two topmen positioned atop a stack of four 40-feet-long containers were waiting to be taken via the crane safety cage to the top of another stack. As the crane operator positioned the spreader bar along the edge of the containers where the topmen were standing, one of the topmen began to step towards the spreader bar to reach the safety cage. At the same time, the crane operator received a call that another container was ready to be unloaded. When the topman was within about one foot of the container's edge, the crane operator suddenly pulled the spreader bar away. The topman was unable to stop, lost his balance, and fell over the side of the container, striking the portal crane's cross beam before landing on the pier. The topman died after falling about 60 feet. (It was 34 feet from the container top to the vessel deck and an additional 26 feet from the vessel deck to the pier.)

Relevant Factors:
The probable cause of this accident is that communication failed. The topmen did not have radios or other means to communicate with the crane operator. Topmen depend upon the crane operator for

directions when accessing the cage on the spreader bar. There should have been continued communication prior to movement of the spreader bar when hoisting personnel.

Both topmen were wearing full body harnesses and were trained in the use of fall protection. However, the available fall protection system could only be used on the off shore side of the spreader bar none on the inshore side. The topmen were on the starboard side of the vessel at the time of the incident and the hookups were on the opposite side.

The crane operator, who had about 10 years of experience operating a crane, pulled the spreader bar away in order to offload another container. He saw the topman stepping about one foot from the edge of the container and assumed that the topman had time to stop. The crane operator was apparently under some time constraints, since the crane had been delayed for repairs. He decided on his own to pick up the topmen and move them to another container to remove twist-locks, in order to save time while another container was being released. The crane operator had radio communication with the gangwayman, but occasionally acted without direction from the gangwayman.

The topmen had to walk a distance of approximately 13 feet across the spreader bar to reach the safety cage. Positioning the spreader bar on the side of containers rather than on top provided easier access to the topmen, according to the crane operator.

At one point prior to the incident, the crane operator tried to signal to the topmen to get off the spreader bar and finally had to get out of the crane and yell to them to get off the bar, indicating that there was a lack of proper communication.

Applicable Standards and Control Measures

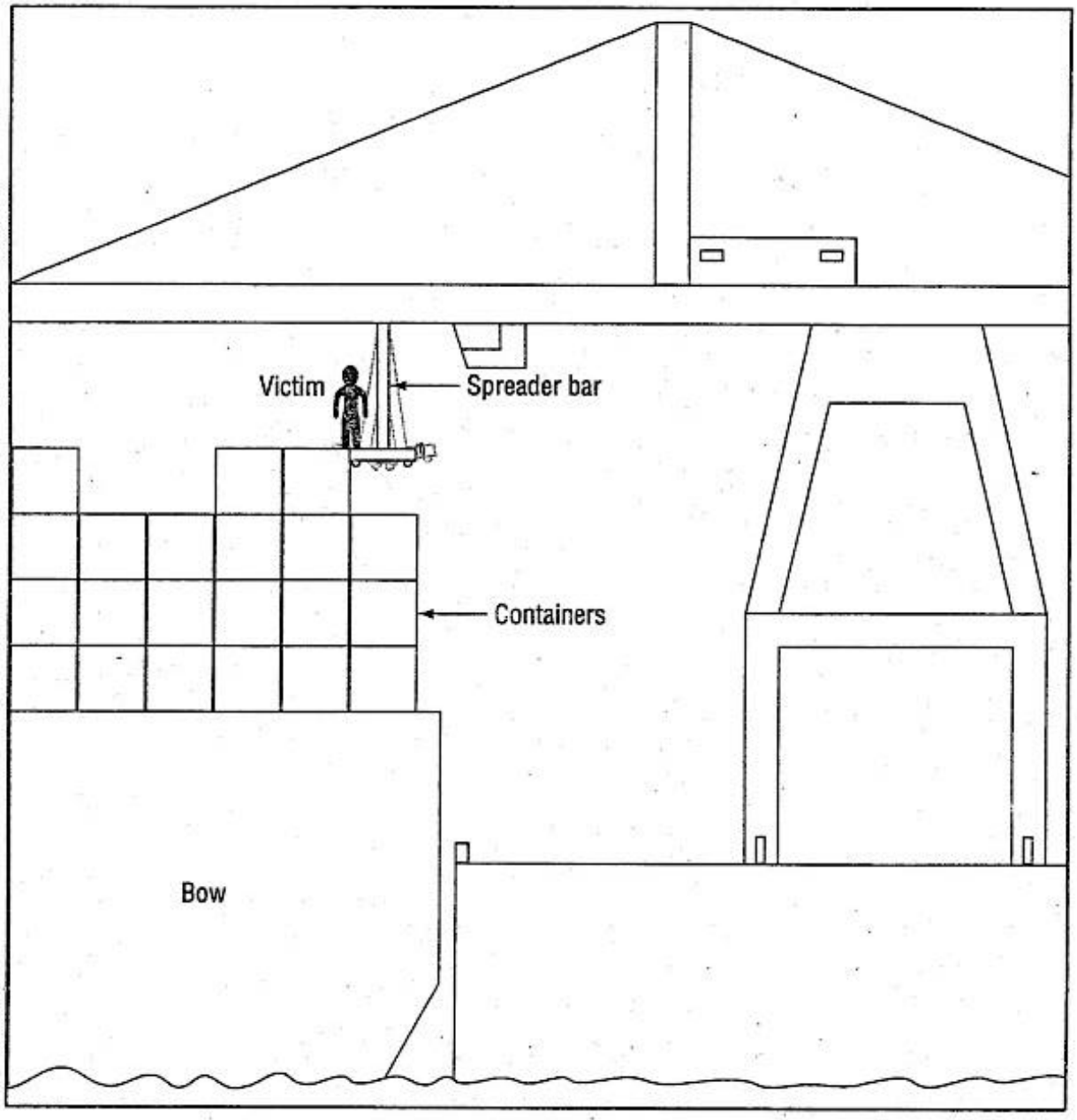
- 29 CFR 1918.85(j)(1)(I): Containerized cargo operations - Fall protection - Containers being handled by container gantry cranes. "After July 26, 1999, where a container gantry crane is being used to handle containers, the employer shall ensure that no employee is on top of a container. Exception: An employee may be on top of a container only to perform a necessary function that cannot be eliminated by the use of positive container securing devices."

- 29 CFR 1918.85(j)(1)(ii): Containerized cargo operations - Fall protection - Containers being handled by container gantry cranes. "After July 26, 1999, the employer shall ensure that positive container securing devices, such as semi-automatic twist locks and above deck cell guides, are used wherever container gantry cranes are used to hoist containers."

This hazard could have been prevented if the employer had used positive container securing devices that eliminate the need for employees to work atop the containers to release them for offloading.

Other Relevant Standards and/or Control Measures

Clearly delineate lines of authority to prohibit the crane operator from acting on his own. The crane operator should communicate with the gangwayman before performing any operations, by using, for example, a walkie-talkie or radio.



Falls/Drowns Summary No.11

Incident Description: Crane operator pulled spreader bar away as worker attempted to step on it

FALLS/DROWNING ACCIDENTS

Summary No. 12 - Closing Covers on Hopper Barge

Hazard

Employees were exposed to the hazard of falling through a broken metal roll top cover into a hopper barge.

Process

Employees were closing the metal roll top covers on a hopper barge at a bulk coal terminal.

Activity at time of incident:

Two metal roll top covers on the barge were being raised by a crane to move them closer together for latching, while a laborer stood on an adjacent metal cover on the barge.

Incident Description

Setting:

An empty hopper barge is moored to the dock of a bulk coal terminal. The hopper barge is approximately 35 feet wide and 195 feet long. The barge is equipped with eight metal roll top covers, each approximately 28 feet wide and 20 feet long. The covers are on wheels and roll on rails on each side of the barge. The crew, which consists of a crawler crane operator and three laborers, is in the process of closing the four metal roll top covers at the stern end of the hopper barge (the four covers on the bow end are already closed). The crawler crane is mounted on the deck of the barge and is rigged with a 20-foot long spreader bar to which is attached a 4-leg bridle. The bridle is used to help the laborers manipulate the covers in order to latch them together and close them. The covers are manually latched together in pairs and then spread out (closed) using the bridle.

Incident:

After the crew had finished closing all four covers at the stern end of the barge, a 3-foot space remained between the roll covers nearest the center of the barge (covers #4 and #5). The laborers hooked up these covers to the crane, so that they could be raised and moved closer together for latching. At the time of the incident, one laborer was standing on a closed metal roll top cover at the bow (cover #3), one laborer was standing on the deck of the barge, and the third laborer (the victim) was standing on a closed roll top cover nearer the stern (cover #6), which was latched to one of the covers (#5) being raised by the crane. As the crane operator raised the covers, tension from the lift spread to the adjacent covers. The pressure caused the welds securing the latch at cover #6 to break loose, and the resulting jolt caused the laborer standing on cover #6 to lose his balance and fall backwards through the opening between covers #6 and #7. The laborer fell 16 feet to the bottom of the barge and was killed.

Relevant Factors:
It was common practice to stand on the covers while performing closing operations.
Although most of the barges that come to the bulk coal terminal have dome-shaped fiberglass covers, approximately 10 percent of the barges have the rolling covers.

Applicable Standards and Control Measures

- Workers should not be allowed to work on top of barge covers and never while rolling or moving the covers.

Other Relevant Standards and/or Control Measures

Supervisors should be trained in accident prevention. Recommended topics include: safety responsibility and authority; elements of accident prevention; leadership and motivation; hazards of longshoring; hazard identification and elimination; applicable regulations; and accident investigations.

Additionally, a stokes stretcher basket and first aid kit should be available at every work station.

SECTION III

MATERIAL HANDLING ACCIDENTS

MATERIAL HANDLING ACCIDENTS

Summary No. 1 - Working Beneath Suspended Load

Hazard

Employees working beneath a turbogenerator suspended by a crane were exposed to the hazard of being struck by the suspended load as they were removing nuts from the bottom bolts of the lifting/jacking lugs.

Process

A barge-mounted crane is used to transfer a turbogenerator from an adjacent barge onto a railroad flatbed car.

Activity at time of incident:

An employee was working underneath the turbogenerator which was suspended in the air 6 to 12 inches above the railroad car, removing nuts that secured a lifting/jacking lug to the turbogenerator.

Incident Description

Setting:

Longshoremen are transferring a 715,000-pound turbogenerator from a barge onto a railroad flatbed car on the dock, using wire rope slings attached to a crane. The turbogenerator is located in one barge and the crane is aboard an adjacent barge. Four lifting lugs are affixed near the corners of the generator. The lifting lugs are designed to be used with a hydraulic, floor-mounted jack to lift and level the generator. Each lug weighs about 750 pounds, is about 30 inches high, and is secured to the generator's housing by four nut-and-bolt assemblies, two on the underside of the lug and two on top.

The longshoring crew consists of a supervisor, a walking foreman, and three longshoremen. They first remove the packing and bracing materials from the turbogenerator in the barge. Next, the crane operator rigs the turbogenerator to the crane, using wire rope slings attached to the generator's built-in lifting points. The crane operator then lifts the turbogenerator out of the barge, swings it towards the railcar, and stops after suspending it about 12 inches above the flatbed railcar and about 65 inches above the ground. At the same time, the crew members are attempting to place support timbers on the flatbed railcar beneath the edges of the turbogenerator, using the lumber from the original packaging and bracing material. However, the nut-and-bolt assemblies at the bottom of the lifting lugs attached to the generator are blocking placement of the support timber in continuous lengths. The workers decide to remove the nuts from the nut-and-bolt assemblies securing the lugs, which will allow the bolts to slide up into the body of the generator and provide the necessary clearance for the timber.

Incident:

The supervisor removed one complete nut-and-bolt assembly from the bottom of a lug and placed it on the railcar. The foreman then removed the second nut at the bottom of the same lug. The 750 pound lifting lug fell on him and killed him.

The crew mistakenly believed that when the bottom nuts were removed, each lug would be held in place by its top two nut-and-bolt assemblies. The other crew members were removing the nuts from the other bottom assemblies when the incident occurred. None of them was aware that the top assemblies were not secured to the turbogenerator. No one else was injured.

Relevant Factors:
A hazard assessment of the lift to be attempted was not conducted prior to the lift. Such an assessment would have revealed that the lugs were not secured to the generator housing by the two upper horizontal bolts of the lifting/jacking lugs. The employees were not warned about hazards associated with working on suspended, swinging, or moving loads, nor were they prohibited from working beneath a suspended load.

Schematics had been provided showing the various dimensions of the generator, and discussing an alternate method of bracing the generator on the railroad car (i.e., a method that did not require employees to work on or beneath a suspended load). A pre-constructed platform or base would have eliminated suspending the load above the railcar in order for the employees to secure the lumber supports on the underside of the turbogenerator.

Applicable Standards and Control Measures

- 29 CRF 1918.81(k): Slinging. "The employer shall require that employees stay clear of the area beneath overhead drafts or descending lifting gear."

This hazard could have been prevented by requiring all employees to keep clear of suspended loads and by developing alternate work practices that did not require employees to work near a suspended load. For example, a platform to support the turbogenerator on the railroad flatbed car could have been constructed prior to setting the load. This hazard may also have been prevented by the following:

1. Conducting a hazard assessment prior to performing the lift, to identify potential hazards and unsafe conditions. Specifically, the supervisor should have conducted a hazard assessment of the procedure for removing the nuts from the lugs prior to performing the operation.

2. Conducting a pre-lift safety meeting with all of the employees involved in the operation to identify potential hazards associated with the lift and to define roles and lines of authority.

3. Providing training in safe work practices to employees involved in rigging and moving large equipment.

Other Relevant Standards and/or Control Measures

- 29 CFR 1917.13(h): Slinging. "The employer shall require employees to stay clear of the area beneath overhead drafts or descending lifting gear."

- All supervisory personnel and machinery operators must be trained in accordance with 29 CFR 1918.98, for longshoring operations, and 29 CFR 1917.27 for marine terminal operations.

MATERIAL HANDLING ACCIDENTS

Summary No. 2 - Improperly Secured Cargo

Hazard
Employees were exposed to the hazard of being struck by improperly secured cargo suspended in a sling attached to a vessel mounted crane's spreader bar.

Process
Stevedoring employees are offloading a cargo of aluminum T - bars using synthetic web slings rigged to a crane's spreader bar.

Activity at time of incident:
A load of four aluminum bars was suspended in a sling above the cargo hold while an employee was working in the hold directly beneath the load.

Incident Description
Setting:
Longshoremen are offloading aluminum bars from holds in a cargo ship, using lifting pans attached to a crane. Aware that the lifting pans are not properly certificated or inspected, the general manager orders the crews to quickly remove the lifting pans and to switch to a system utilizing four suspended synthetic slings rigged to the crane's spreader bar. The crew in this hold, which consists of a foreman and three laborers, are inexperienced in rigging loads using slings but they attempt it anyway.

Incident:
At the time of the incident, the crane operator was hoisting the spreader bar which supported four individually slung aluminum T-bars. Each bar weighed approximately 1,300 pounds. Once the load cleared the top of the hatch, the crane operator began to laterally swing the load toward the pier. As the load moved to the side, the last T-bar slipped from its sling and fell back into the hold. The T-bar fell about 27 feet down into the hold, and either directly hit the employee in the hold, or glanced off another T-bar before hitting the employee, who was killed instantly.

Relevant Factors:
No one in hold was qualified by training or experience to attach such a load to the slings or to supervise the rigging. The load was not properly slung, and employees were not clear of the load while it was being lifted. No formal special training was provided regarding handling various types of cargo, and metal products can be slippery and difficult to handle.

No members of the rigging crew involved in the fatality were present at the planning session where the use of the synthetic sling and spreader bar system was demonstrated.

The lifting pans were the preferred method of removing the T bars from the vessel, and should have been

tested and certified in lieu of using synthetic slings.

Three of the synthetic slings were found to have snags, tears and cuts. In addition to the cargo handling gear hazards, numerous other hazards existed. Electrical hazards were found, involving temporary wiring, unapproved use and installations of electrical equipment, and extension cords. Blocked and unmarked exits, machine guarding hazards, and fall hazards also existed.

Applicable Standards and Control Measures

- 29 CFR 1918.81(a): Slinging. "Drafts shall be safely slung before being hoisted. Loose dunnage or debris hanging or protruding from loads shall be removed."

- 29 CFR 1918.81(k): Slinging. "The employer shall require that employees stay clear of the area beneath overhead drafts or descending lifting gear."

- 29 CFR 1918.61(a): General - Employer provided gear inspection. "All gear and equipment provided by the employer shall be inspected by the employer or designated person before each use and, when appropriate, at intervals during its use, to ensure that it is safe. Any gear that is found upon such inspection to be unsafe shall not be used until it is made safe."

- 29 CFR 1918.61(b)(1): General - Safe working load. " The safe working load of gear as specified in 1918.61 through 1918.66 shall not be exceeded."

- 29 CFR 1918.61(b)(2): General - Safe working load. "All cargo handling gear provided by the employer with a safe working load greater than five short tons (10,000 lbs. or 4.54 metric tons) shall have its safe working load plainly marked on it."

- 29 CFR 1918.61(d): General - Certification. " The employer shall not use any material handling device listed in paragraphs (f) and (g) of this section until the device has been certificated, as evidenced by current and valid documents attesting to compliance with the requirements of paragraph (e) of this section."

- 29 CFR 1918.61(f)(1): General - Special gear. "Special stevedoring gear provided by the employer, the strength of which depends upon components other than commonly used stock items such as shackles, ropes, or chains, and that has a Safe Working Load (SWL) greater than five short tons (10,000 lbs. or 4.54 metric tons) shall be inspected and tested as a unit before initial use (see Table A in paragraph (f)(2) of this section). In addition, any special stevedoring gear that suffers damage necessitating structural repair shall be inspected and retested after repair and before being returned to service."

- 29 CFR 1918.62(g)(2): Miscellaneous auxiliary gear - Synthetic web slings. "Synthetic web slings shall be removed from service if they exhibit any of the following defects:

(g)(2)(i): Acid or caustic burns;
(g)(2)(ii): Melting or charring of any part of the sling surface;
(g)(2)(iii): Snags, punctures, tears or cuts;
(g)(2)(iv): Broken or worn stitches;

(g)(2)(vi): Display of visible warning threads or markers designed to indicate excessive wear or damage."

This hazard could have been prevented if the employer had properly inspected, tested, and certified its equipment or had instructed and supervised its employees in the proper selection method of attaching a sling to an aluminum T-bar. The hazard may have also been prevented if the employer had ensured that employees remain clear of a suspended load at all times and that employees were properly trained in rigging methods prior to performing the operations. The employer should also have ensured that:

- All lifting pans and spreader bars were properly tested, inspected, and certificated;

- All lifting pans and spreader bars were properly marked with the safe working load; and

- Synthetic web slings were properly inspected and removed from service when defects were found.

MATERIAL HANDLING ACCIDENTS

Summary No. 3 - Unbalanced Load

Hazard
Employees were exposed to the hazard of being struck by an unbalanced load in a nylon sling attached to a crane.

Process
Employees are using a crane and a forklift to raise and tip a large press machine on its side in order to position it for shipment.

Activity at time of incident:
A crane operator was using a pendant control to raise a large press machine, as a forklift operator tipped the machine.

Incident Description
Setting:
A crane operator and a forklift operator working in a warehouse are in the process of moving a large press machine in preparation for shipping it overseas. The 3,500-pound press machine is secured in a nylon sling, which is attached to an overhead crane in a basket configuration. The workers are attempting to set the machine on its side on a skid. The forklift is used to tilt the machine as the crane helps to hoist it and lower it on its side.

Incident:
Using a pendant control, the crane operator began lowering the press as the forklift operator tilted it forward, when one end of the nylon sling securing the press slipped off the hook attached to the crane's chain sling. At the time of the incident, the crane operator was standing about two feet in front of the machine (too close) and was killed when the machine fell on him.

Relevant Factors:
The load was not balanced and the sling was subject to slippage. It appears that as the machine was being tilted the nylon sling did not slide as anticipated, creating enough slack for one end of the sling to dislodge from the hook. The use of a basket hitch on a crane during such an operation would make it impossible to balance the load to prevent the sling from sliding.

There were no established procedures for tipping the machine using a crane and a forklift, nor did the employees receive any training in such operations.

The employees had just successfully performed a similar operation on another piece of equipment. One witness reported that they had tried lifting the first unit in a choker configuration but the piece could not be lifted, so they changed to a basket hitch instead.

The victim had one notice in his personnel file for passing under a suspended load. On the day of the incident, he was told by the forklift operator twice to stand clear of the suspended load, once during the first lift and then just before the machine fell. The forklift operator should have been trained to stop the operation until the hazard was corrected.

The employees did not recall receiving training on inspection of ropes, hooks, or other crane components.

Applicable Standards and Control Measures

- 29 CFR 1917.13(a): Slinging. "Drafts shall be safely slung before being hoisted. Loose dunnage or debris hanging or protruding from loads shall be removed."

- 29 CFR 1917.45(k): Cranes and derricks - Routine inspection.
  (k)(1): "Designated persons shall visually inspect each crane and derrick on each day of use for defects in functional operating components and shall report any defect found to the employer. The employer shall inform the operator of the findings.
  (k)(2): A designated person shall thoroughly inspect all functional components and accessible structural features of each crane or device at monthly intervals.
  (k)(3): Any defects found during such inspections which may create a safety hazard shall be corrected before further equipment use. Repairs shall be performed only by designated persons.
  (k)(4): A record of monthly inspections shall be maintained for six months in or on the crane or derrick or at the terminal."

- 29 CFR 1917.50 (c)(1): Certification of marine terminal material handling devices. "Each crane and derrick shall be tested as a unit quadrennially, and shall be examined annually. Certificates of tests and examinations shall be made readily available for inspection."

The employer should have ensured that the crane was inspected in accordance with the above standards.

- 29 CFR 1917.42(a): Miscellaneous auxiliary gear - Routine inspection.
  (a)(1): "At the completion of each use, loose gear such as slings, chains, bridles, blocks and hooks shall be so placed as to avoid damage to the gear. Loose gear shall be inspected and any defects corrected before reuse.
  (a)(2): All loose gear shall be inspected by the employer or his authorized representative before each use and, when necessary, at intervals during its use, to ensure that it is safe. Any gear which is found upon such inspection to be visibly unsafe shall not be used until it is made safe.
  (a)(3): Defective gear shall not be used. Distorted hooks, shackles or similar gear shall be discarded."

The employer should have ensured that the chains on the crane were inspected in accordance with above standard. Additionally, the employer should have ensured that employees were adequately trained in the proper use of slings and cranes. Further, safety procedures for performing this type of operation, using a crane and a forklift to tilt and hoist a heavy piece of machinery, should have been developed prior to the operation.

Other Relevant Standards and/or Control Measures

- 29 CFR 1917.13(h): Slinging. "The employer shall require employees to stay clear of the area beneath overhead drafts or descending lifting gear."

MATERIAL HANDLING ACCIDENTS

Summary No. 4 - Wrong Clamp Attachment On PIT

Hazard
Employees were exposed to the hazard of being struck/crushed while standing beneath an elevated and improperly loaded lift truck.

Process
Material handling using a lift truck with a paper roll clamp attachment to transport cargo.

Activity at the time of incident:
Repairing shrink wrap cocooned around two wood pulp paper rolls stacked on top of each other.

Incident Description
Setting:
A break bulk cargo ship was being loaded with 2-roll units of processed paper pulp. The two rolls were cocoon wrapped together in clear polyethylene packaging to form a unit weighing approximately 2,000 pounds. Each individual roll was approximately 60 inches in diameter and 19 inches high. The units (each consisting of 2 rolls) were stacked in the terminal warehouse. The rolls were stacked one on top of the other with their flat sides parallel to the ground, and their axis vertical (similar to stacking tires). Powered industrial trucks (PITs) with flat clamp attachments designed for flat-sided cargo grasped the 2-roll units on their round side for transport to the dock. The load was placed on a steel pan at the dock and then loaded onto the ship by a crane. While some workers were loading the 2-roll units onto the ship, others were on dock tape patching damaged cocoon wrap on the bottom of the 2- roll units.

Incident:
At the time of the accident, the PIT operator maneuvered the truck into the area on the dock where the workers were repairing the damaged wrap and elevated the load approximately six feet above the dock surface. A six foot high support stand called a core plug stand was available to safely hold the load aloft, but not used. The operator left the truck and went under the elevated load to help the two dock workers tape torn sections of the polyethylene wrap on the bottom of the lower roll. While the operator was patching under the load, the bottom roll dropped out of the clamp, fatally crushing him. The other two workers were standing to the side of the roll when the incident occurred.

Relevant Factors:
Following the incident, it was determined that both the lift truck and the roll clamp were inspected and maintained in proper working order. However, the clamps that were attached to the PIT were the wrong clamps for this particular operation. The model clamp used on the PIT was manufactured for flat sided rolls rather than round sided. Therefore, when the truck operator (who was an experienced industrial truck operator) picked up the load, it was not fully engaged. On this particular lift, the top roll was securely clamped, however, only 2 inches of the 19 inches of the bottom roll was engaged.

This was not secure enough to hold the weight of the lower roll when suspended above the employees repairing the shrink wrap.

The stevedoring company had been using the wrong clamp attachment for this operation, with what they believed was the implied approval of the manufacturer's representative. The representative had observed the loading of this cargo, but failed to report that the clamp being used was not correct for this operation.

Applicable Standards and Control Measures:

- 29 CFR 1910.178 (l)(4)(ii)(A): Powered industrial trucks - Operator training - Refresher training and evaluation. "The operator has been observed to operate the vehicle in an unsafe manner."

This hazard could be prevented by not standing or passing under an elevated portion of any lift truck whether it is empty or loaded.

- 29 CFR 1917.43(b)(3): Powered industrial trucks - General. "When PITs are left unattended, the load engaging means shall be fully lowered, controls neutralized and brakes set."

This hazard could be prevented by the operator remaining in the cab, or lowering the load onto a stand which would have fully engaged the load safely.

- 29 CFR 1917.43(e)(3): Powered industrial trucks - Fork lift trucks - Forks. "Forks, fork extensions and other attachments shall be used only in accordance with the manufacturer's recommendations."

This hazard could be prevented by using the correct clamps for the appropriate load.
In this instance round clamps designed to grasp the load on the round side should have been used.

MATERIAL HANDLING ACCIDENTS

Summary No. 5 - Defective Spreader Bar

Hazard
Employees were exposed to the hazard of being struck by the I-beam spreader bar that disengaged from a bridge crane.

Process
A bridge crane with an I-beam spreader bar is used to load bags of grain into a lash barge.

Activity at time of incident:
Longshoremen in the barge were re-hooking synthetic slings to the crane's spreader bar. The slings had been used to secure bags of grain during loading into the barge.

Incident Description
Setting:
A lash barge is moored to the dock and a crew of longshoremen is loading bags of grain (corn-soy blend) into the barge. The crew consists of a crane operator, a forklift operator, and one laborer working on the loading dock, and five laborers working inside the barge positioning the cargo. The operation is supervised by a superintendent and the crew foreman.

A 15-ton bridge crane, equipped with a 2,500-pound I-beam spreader bar, is used to transfer the bags of grain from the dock into the barge. The spreader bar is constructed of 3/8-inch plated steel, and is 18.5 ft long and 21 inches high. It is rigged with eight wire ropes, which are each eight feet long and fitted with hooks. The forklift operator places the 55-pound bags of grain onto the dock, where they are stacked in groups of 40 bags and secured in synthetic slings. The synthetic slings around each stack are then hooked to the wire ropes on the crane's spreader bar, and the crane loads eight stacks at one time into the barge. Each load contains a total of 320 bags and weighs 17,636 pounds. Once the stacks are placed in the barge, the crew in the hold removes the synthetic slings around the stacks, first unfastening the snaps on the synthetic slings and then reattaching the slings to the crane's spreader bar hooks on just one side. The crane operator then raises the hoist, and the synthetic slings are pulled away from the cargo.

Incident:
One set of synthetic slings had been successfully removed from a stack and three of the laborers in the barge were setting up the spreader bar to remove another set of slings. The laborers were rehooking the synthetic slings to the spreader bar, when the spreader bar fell from the crane's hoist. The spreader bar landed on top of one laborer and struck a second laborer in the head and torso as he attempted to run out of the way. Both employees struck by the spreader bar were killed. The third longshoreman was able to move out of the way of the spreader bar and was not injured.

Relevant Factors:
The crane had not been subjected to daily or monthly inspections. No designated individual conducted inspections of the crane or the crane's components. Supervisory accident prevention training was not provided. The investigation revealed that a 5/8-inch wire rope (presumably rigged to the crane) was completely severed and both ends were badly frayed, attributed to

progressive wear-and-tear rather than sudden breakage. Additionally, the top of the crane block was damaged and the sheaves on the block were out of alignment.

The company's safety rules warned the crane operator not to perform lifts over people's heads, and numerous signs posted at the site warned employees of the dangers of the overhead crane.

Signs indicating telephone numbers of emergency personnel were not posted in a conspicuous location. Additionally, not all of the areas around the barges were protected with safety nets or other fall protection, exposing employees to fall and drowning hazards.

Applicable Standards and Control Measures

- 29 CFR 1918.81(K): Slinging. "The employer shall require that employees stay clear of the area beneath overhead drafts or descending lifting gear."

  This hazard could have been prevented if employees had not been permitted to work beneath the suspended crane spreader bar. Hooking the cargo slings to the spreader bar should have been performed while the spreader bar was positioned as close to the floor of the barge as possible, rather than suspended above the laborers.
  Additionally, the hazard could have been prevented if the laborers had moved a safe distance from the spreader bar before the crane operator lifted the hoist to remove the cargo slings.

  Moreover, the employer should have established and enforced crane safety rules, such as the guidelines set forth in ANSI B30.2, *Overhead and Gantry Cranes*.

- 29 CFR 1917.27(b)(1): Personnel - Supervisory accident prevention proficiency. "After October 3, 1985 immediate supervisors of cargo-handling operation of more than five (5) persons, shall satisfactorily complete a course in accident prevention. Employees newly assigned to supervisory duties after that date shall be required to meet the provisions of this paragraph within ninety (90) days of such assignment."

  This hazard may have been prevented if supervisors had been appropriately trained in accident prevention. The supervisor should have ensured that all employees involved in the cargo handling operation follow safe work practices, including never working beneath suspended loads.

- 29 CFR 1917.45(k)(1): Cranes and derricks - Routine inspection. "Designated persons shall visually inspect each crane and derrick on each day of use for defects in functional operating

components and shall report any defect found to the employer. The employer shall inform the operator of the findings."

29 CFR 1917.45(k)(2): Cranes and derricks - Routine inspection. "A designated person shall thoroughly inspect all functional components and accessible structural features of each crane or device at monthly intervals."

This hazard may have been prevented if an appropriately qualified individual had been designated to perform regular daily inspections of each crane in use, as set forth in 29 CFR 1917.45(k)(1), and to perform crane inspections at monthly intervals, as set forth in 29 CFR 1917.45(k)(2). Defects, such as the frayed wire rope, may have been identified during the course of such an inspection and repaired before creating a serious hazard. In the case of defects that could affect the safe operation of the crane, the crane should have been taken out of service until the defect was corrected.

MATERIAL HANDLING ACCIDENTS

Summary No. 6 - Unstable Stacked Slabs

Hazard
Employees were exposed to the hazard of being struck by stacked steel slabs.

Process
Longshoremen are using a forklift to transfer slabs of steel from a pier to a flatbed truck.

Incident Description
Setting:
Longshoremen at a marine terminal are loading steel slabs onto flatbed trailer trucks. The slabs are each seven inches thick, about two feet wide, and 20 feet long, and are stacked one atop another lengthwise in tiers of seven slabs. Pieces of wood blocks (chocks 4 inches by 4 inches, each about 2 to 3 feet long) are placed in between the steel slabs to serve as spacers to separate the slabs so that the forklift truck operator can slide the forklift blades under each slab. The stacked tiers are placed very close together. Three employees are performing this operation. One employee drives the forklift truck, and the other two employees remove the wooden spacers that are exposed after a steel slab is lifted and removed so that the forklift truck could get the next slab. It was raining fairly steadily on the afternoon of the accident.

Incident:
At the time of the incident, the employees were working on a pile that had three steel slabs left. Just behind this pile was a tier of seven steel slabs about seven feet high. One employee (the victim) was attempting to remove a wooden spacer from the front stack that had protruded into the rear tier and had become embedded in that tier. The employee had to remove the spacer so that the forklift truck could load the next steel slab in the front stack. As the employee attempted to pull the wooden spacer that was stuck and protruding out of the rear stack, three slabs from this rear tier, weighing about 20,000 pounds, fell and struck the employee. He was killed after being crushed by the slabs of steel.

Relevant Factors:

An adjacent stack of steel slabs was leaning at a 5-degree angle, and the asphalt ground on which the stacks were placed was uneven and had numerous holes. Workers were observed tripping and falling as a result of the holes, and the victim's foot may have become caught in a hole as he attempted to move out of the way of the toppling stack.

The forklift truck was likely a contributing factor destabilizing the back tier by inadvertently striking it with overlength forks. The forklift blades were about six feet long, and the stacks were about two feet deep. This would allow several feet of the length of the blade of the forklift to go into the tier that was behind the tier being worked. The rear stack itself was only inches from the stack in front. The forklift truck did not have a backup alarm, which is recommended but not required.

Applicable Standards and Control Measures

- 29 CFR 1917.14: Stacking of cargo and pallets. "Cargo, pallets and other material stored in tiers shall be stacked in such a manner as to provide stability against sliding and collapse."

The steel slabs were not stacked to prevent sliding or collapsing. The slabs were stored in tiers seven high, on an incline, close together, and on asphalt paving.

This hazard may have been prevented if the employer had ensured that the stacks of steel slabs were placed in a stable arrangement. For example, the stacks should have been positioned far enough apart to avoid unintended contact with the forklift blades and they should have been placed on a level surface.

Other Relevant Standards and/or Control Measures

Develop and implement procedures for performing this task safely.

MATERIAL HANDLING ACCIDENTS

Summary No. 7 - Improper Loading Procedure

Hazard
Employees were exposed to the hazard of being struck and crushed by a stack of crates that toppled over during a forklift/material handling operation.

Process
After unloading crates of fiberboard panels from the ship's hold to the dock using a crane with a spreader, longshoremen transport the freestanding crated cargo by a forklift to a nearby warehouse.

Activity at time of incident:
A forklift operator had inserted the forks of the truck which were 42 inches long under a load of stacked crates which were 31 ½ inches wide, and proceeded to lift the load. The operator did not realize that the crates were narrower than the crates he had been previously handling. The forks extended beyond the base of the intended load to the base of an adjacent stack of crates, which toppled as the forks were lifted. Two laborers were behind the north side of the crates to reconnect the slings back to the spreader so that the crane could return to the ship's cargo compartment.

Incident Description
Setting:
Large crates of fiberboard panels are offloaded from a ship, set on a dock, and transported by forklift to a warehouse. Each crate is about 100 inches long and 30 inches high, and weighs about 2,700 pounds. To move the crates out of the ship's hold, the longshoremen uses an on-board crane equipped with a spreader bar. The crates are rigged with slings connected to the spreader bar and are usually offloaded six at a time (in two stacks of three). Two laborers receive the cargo on the dock, unhooking the slings to free the cargo and then reconnecting the slings to the crane's spreader bar in preparation for another load. The freestanding crates, stacked three high, are transported by forklift from the cargo dock to a nearby warehouse.

Incident:
At the time of the incident, the two laborers were in the process of unloading a stack of three crates on the dock. The crane operator had placed the stack alongside a similar stack that was about to be moved by a forklift. The two laborers were on the north side of the stacks reconnecting the slings to the crane's spreader bar, as the forklift approached from the opposite side. The stacks were 90 inches tall and 100 inches long, preventing the forklift operator from seeing the two laborers working on the other side. The forklift operator inserted the forks (42inches long) completely under the closest stack of crates (31 ½ inches wide), but because the forks were wider than the load, the forks extended 10 inches beyond the intended load under the base of the adjacent stack. When the forklift operator raised the intended load, the adjacent stack of crates toppled and fatally crushed one of the laborers.

Relevant Factors:
The forks were 42 inches long and the stack of crates was only 31.5 inches wide at the base. The forklift operator had not realized that this load was narrower than the previous loads, although the cargo dimensions were clearly stenciled on each crate. The width is very hard to judge while the material is in the air. Unless someone tells the operator of the change in load size, the operator can be unaware of this condition. Only six crates in the entire shipment were 31.5 inches deep. All the other crates were deep enough that the forks did not extend beyond the load.

Due to the dimensions of the cargo the forklift operator did not see the two men standing on the north side of the load.

The supervisor should have checked to determine if the load size was changing so the appropriate fork could be used or a different loading procedure could be implemented.

Applicable Standards and Control Measures

- 29 CFR 1917.43(b)(6): Powered industrial trucks - General. "Only stable and safely arranged loads within the rated capacity of the truck shall be handled."

This hazard could have been prevented if either the loading procedures were revised to accommodate a change in load size or if the employer had implemented a system to communicate changes in load size to the forklift operator and had ensured that workers remained within view of the forklift operator and away from the potential path of falling cargo. Further, this hazard could have been prevented if there had been sufficient space between stacks to prevent a forklift from accidentally catching an adjacent load in the forks.

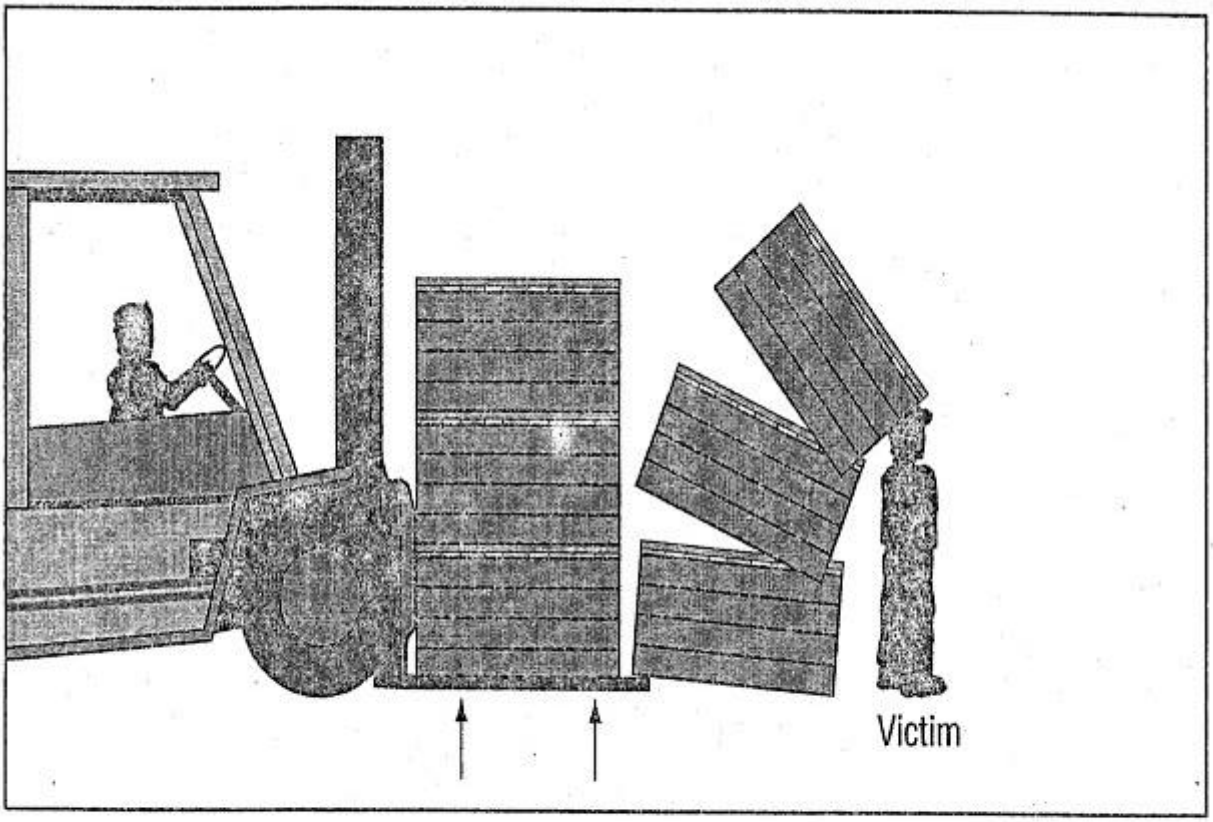
Other Relevant Standards and/or Control Measures

- 29 CFR 1917.43(b)(8): Powered industrial trucks - General. "The employer shall direct drivers to slow down and sound the horn at crossaisles and other locations where visibility is obstructed."

The forklift operator must sound the horn to alert others in the vicinity of his approach, whenever his field of vision is obstructed.

- 29 CFR 1910.178(l): Powered industrial trucks - Operator training. "The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely as demonstrated by the successful completion of the training and evaluation specified in this paragraph."

Train the operator, through initial and periodic refresher training, to observe all safe operating procedures.



Material Handling Accidents Summary No.7

Incident Description: Victim was struck by toppling crates that became dislodged by forklift blades

MATERIAL HANDLING ACCIDENTS

Summary No. 8 - Improperly Secured Load

Hazard
Employees were exposed to the hazard of being struck by falling paper rolls that were improperly secured in the cargo hold of a ship.

Process
An on-board crane is used to load rolls of paper into the hold of a ship.

Activity at time of incident:
Two employees helping to load paper rolls in the hold of a ship were taking a break in the hold when a stack of paper rolls about 26 feet high toppled and fell on them.

Incident Description
Setting:
Longshoremen are loading paper rolls into a ship's hold, using an on-board crane equipped with a pan attached to the spreader bar. The hold was approximately 34 feet deep. The paper rolls are about 40 inches high and 40 inches in diameter, and weigh about 1,400 pounds each. The crane operator picks up approximately 16 rolls of paper at a time on a pan with a spreader bar from the dock and then lowers the load into the center of the ship's hold. A forklift operator working in the hold then stacks the rolls in rows along the front and sides of the hold. Each stack consists of seven or eight rolls and is about 26 feet high. Two other employees, "helpers," also work in the hold, placing cardboard on the deck where the paper rolls are to be stacked.

The employees first load the front of the hold, and then begin to stack the rolls along the starboard side of the vessel, forward to aft. After two rows of paper rolls have been stacked on the starboard side, the ship has a noticeable list to the starboard side. At the direction of a crew member, the employees then place two rows of paper rolls on the port side to alleviate the list.

Incident:
At the time of the incident, the forklift operator was stacking rolls on the starboard side at the aft end, while the helpers took a break near a pile of cardboard in the center aft end. The loaded forklift caused the ship to list and a stack of paper rolls on the port side fell toward the starboard side. The rolls struck both helpers, killing one employee and injuring the other.

Relevant Factors:

Planning for cargo placement to preserve the stability of the vessel should be accomplished prior to loading. Their efforts to steady the ship was not effective.

Powered industrial trucks (PITs) were not maintained in safe working order. Deficiencies included inoperable brakes, inoperable horn, and broken front windshields.

Applicable Standards and Control Measures

- 29 CFR 1918.83(a): Stowed cargo; tiering and breaking down. "When necessary to protect personnel working in a hold, the employer shall secure or block stowed cargo that is likely to shift or roll."

This hazard could have been prevented by ensuring that the paper rolls were adequately secured to prevent shifting. Additionally, this accident may have been prevented if the employer had undertaken further efforts to reduce the ship's list by redistributing the load in the hold.

- 29 CFR 1918.98(b)(1): Qualifications of machinery operators and supervisory training - Supervisory accident prevention proficiency. "Immediate supervisors of cargo-handling operations of more than five (5) persons shall satisfactorily complete a course in accident prevention."

This accident may have been prevented if a supervisor properly trained in hazard recognition, accident prevention and vessel stability had been present to ensure that the cargo was properly distributed and secured and that employees worked in a safe location away from the potential path of falling cargo.

Other Standards and/or Control Measures

- 29 CFR 1918.24(a): Fixed and portable ladders. "There shall be at least one safe and accessible ladder for each gang working in a single hatch. An effective means of gaining a handhold shall be provided at or near the head of each vertical fixed ladder. No more than two ladders are required in any hatch regardless of the number of gangs present."

A ladder should be available for the employees to use while working in the hold.

- 29 CFR 1918.65(f)(1): Mechanically powered vehicles used aboard vessels - Maintenance. "Mechanically powered vehicles shall be maintained in safe working order. Safety devices shall not be removed or made inoperative except where permitted in this section."

- 29 CFR 1918.65(f)(2): Mechanically powered vehicles used aboard vessels - Maintenance. "Braking systems or other mechanisms used for braking shall be operable and in safe condition."

PITs in use must be maintained in safe working order, e.g., with operable brakes and horns.

MATERIAL HANDLING ACCIDENTS

Summary No. 9 - Inadequately Rigged Load

Hazard
Employees unloading bundles of scrap steel from a ship's hold were exposed to the hazard of being struck by the raised load.

Process
A barge-mounted crawler crane is used to unload bundles of steel rails from a bulk carrier vessel.

Activity at time of incident:
Longshoremen were in the cargo hold while a crane lifted one end of a bundle of scrap steel with a "breakout" wire. The bundle was being raised so that the two wire rope slings used with the crane could be placed under the bundle to unload it.

Incident Description
Setting:
A bulk carrier vessel (with no tween decks) is moored with its starboard side against two steel-decked barges. Each barge is moored to the pier and equipped with a crawler crane which is used to discharge the vessel carrying 46,000 tons of used steel, banded together in bundles. The cranes have a 75,000-pound capacity and are mounted on the barges because the pier cannot support their weight. Each bundle is about 24 feet long and weighs approximately 17.5 tons. Two gangs, each consisting of a "leadman" (supervisor) and 4 laborers, are working aboard the vessel unloading the scrap steel. The leadman communicates by radio with the crane operator, who relies on the leadman to direct his movements and to ensure the load is properly rigged for unloading.

Each bundle of steel is transferred from the cargo hold in two wire rope slings, which are rigged in a basket hitch configuration to the crane's spreader bar. To allow the laborers to place the lifting wire rope slings under the bundle, it first had to be lifted at one end by a wire called a "breakout wire", which is a longer and smaller diameter wire placed under one end of a bundle. The leadman directs the laborers to stand clear of the bundle and signals the crane operator by radio to begin raising the bundle high enough to allow the laborers to place the actual lifting wire rope slings under both ends of the bundle. The leadman then signals the crane operator to lower the load so that the laborers may remove the breakout wire from the crane's spreader bar and hook the lifting wire rope slings to the crane's spreader bar. Once the bundle is rigged to the crane, the leadman directs the laborers to stand clear of the load and signals the crane operator by radio to lift the bundle out of the hold.

Incident:
At the time of the incident, the breakout wire had been placed under one end of a bundle of steel and hooked to the crane's spreader bar. At the leadman's direction, the laborers moved to the corners of the hold in order to stand clear of the load. The leadman then directed the crane operator to slowly raise the end of the bundle. After the end of the bundle was raised about 3 feet, the leadman contacted the crane operator by radio to stop raising the load so that he could check the cable. After

the leadman determined that the breakout cable was properly rigged, he signaled to the crane operator to continue to slowly raise the end of the bundle. As the two laborers approached the bundle to place the wire rope slings, the bundle began to swing towards them. They attempted to run out of the way, moving in opposite directions, but the bundle struck one of the laborers in the back. The leadman then directed the crane operator to halt the lift and hold the bundle in a raised position. The laborer who was struck died as a result of his injuries.

Relevant Factors:
It appears that the primary cause of the accident was that the 2 laborers came out from their position in the corner of the hatch to the bundle of steel rails while it was being lifted. Additionally, the leadman failed to ensure that the laborers were clear of the load prior to directing the crane operator to begin raising the bundled steel for the second time. Initially it was believed that the bundle of steel swung because it had become caught in between the ribs of the vessel, but the bundle's movements were later attributed to the boom angle of the crane and the angle at which the breakout wire was rigged to the crane.

The use of two-way radios for communication between the leadman and the crane operator was determined to be an appropriate and necessary means of communication for this operation. The leadman was down in the hold with the cargo, the crane operator was in the crawler crane mounted on the steel deck barge berthed between the ship and the dock.

This was the fourth ship carrying steel rails that the crew had unloaded. The three previous ships had been unloaded without incident. The crane operator was experienced and was licensed by the state. He had been the crane operator for the three previous ships. None of the previous loads had slipped while they were being lifted, but in a few instances the breakout wire had slipped off the end of the bundle.

The breakout wire, slings, and crane were in good condition. However, the crane was not equipped with a load-indicating device, and the accessible areas within the swing radius of the crane were not properly guarded.

Applicable Standards and Control Measures

- 29 CFR 1918.81(k): Slinging. "The employer shall require that employees stay clear of the area beneath overhead drafts or descending lifting gear."

- 29 CFR 1918.81(a): Slinging. "Drafts shall be safely slung before being hoisted. Loose dunnage or debris hanging or protruding from loads shall be removed."

The employer should ensure that employees are not permitted to work or pass under overhead loads, that loads are properly rigged before lifting, and that the crane operator and signalman have proper and effective communication at all times.
The load should not be picked up while the lifting wires are at an angle which could cause the load to swing when lifted.

Hold workers, and flagmen should be trained to observe the angle of the lifting wires and to anticipate possible swinging of the load.

Other Standards and/or Control Measures

- 29 CFR 1918.66 (b)(2: Crane and derricks other than vessel's gear - Operations - Guarding of swing radius. "Accessible areas within the swing radius of the body of a revolving crane shall be physically guarded during operations to prevent an employee from being caught between the body of the crane and any fixed structure or between parts of the crane."

- 29 CFR 1918.66 (f)(1): Cranes and derricks other than vessel's gear - Load-indicating devices. " . . . every crane used to load or discharge cargo into or out of a vessel shall be fitted with a load-indicating device or alternative device in proper working condition . . .."

MATERIAL HANDLING ACCIDENTS

Summary No. 10 - Improperly Secured Cargo

Hazard

Employees were exposed to the hazard of being struck by falling cargo (bundles of lumber secured with oak dunnage) that had been improperly secured in a ship's hold.

Process

Laborers load bundles of lumber into the hold of a ship.

Activity at time of incident:

Laborers were positioning bundles that were stacked four high along the bulkheads of the bow of the ship. The top 2 bundles were resting on another set of bundles but were not flush with each other. Dunnage was used to wedge the bundles against the bulkhead. A laborer released all the eyes of the slings from the spreader bar instead of just one on each end of the bar, causing the slings to fall behind the stack of bundles and the bulkhead. When he attempted to retrieve the slings so that they could be re-hooked to reposition the bundles, one of the pieces of dunnage supporting the bundles cracked, causing the bundles to shift and strike the employee.

Incident Description

Setting:

Longshoremen are loading bundles of lumber into a ship's hold. Each bundle is about 2 feet high, 3.5 feet wide, and 24 feet long, and weighs approximately one ton. The ship's crane is rigged with a spreader bar and two synthetic web slings in a basket hitch configuration to support the bundles of lumber. The bundles are wrapped with three ½ inch bands to keep the lumber from slipping out of the slings. The crane operator lifts two bundles at a time from the dock (stacked one on top of another lengthwise) and lands them in the ship's hold, with assistance from the gang in the hold. The gang, a skilled laborer (the gang leader) and three others, guide the bundles into place and secure them in the ship's bulkhead with dunnage. The laborers then free the crane of the load by unhooking one eye of each sling from the spreader bar.

Incident:

At the time of the incident, the crane operator had just landed two bundles into the hold, placing them on top of another stack. The top two bundles were not aligned completely with the bottom ones, and the gang used dunnage to wedge them against the ship's bulkhead. After securing the bundles, one of the laborers unhooked all of the eyes from the two slings connected to the spreader bar, causing both slings to fall into a space between the stacks of bundled lumber and the ship's bulkhead. The gang leader directed the laborer to go around and under the stack of bundles to the space between the bundles and the bulkhead to retrieve the slings. At the same time, one of the pieces of oak dunnage securing the top two bundles broke, causing the bundles to shift and fall. The laborer was struck by the falling lumber. It did not crush him but pinned him in a crouched position where he suffocated.

Relevant Factors:
The victim was inexperienced. He unhooked all eyes from the slings connected to the spreader bar rather than unhooking just one eye from each sling.
The gang leader directed the laborer to go around the stack and reach under them to retrieve the slings, placing him in an unsafe position.

Earlier in the shift, some of the pine dunnage used to support the bundled lumber had broken so stronger oak dunnage was being supplied to the hold crew..

Most of the gang in the hold at the time of incident lacked experience. The company relied on the gang leader to direct the operation. The supervisor was not near the hold when the accident occurred though he periodically monitored the operation. Temporary employees received on-the-job training from skilled employees in how to land, handle, and secure the lumber.

The ship's gear and spreader bar were appropriately certified at the time of the incident. There were no problems with the slings nor did the banding break on the bundles of lumber.

Applicable Standards and Control Measures

- 29 CFR 1918.83(a): Stowed cargo; tiering and breaking down. " When necessary to protect personnel working in a hold, the employer shall secure or block stowed cargo that is likely to shift or roll."

This hazard could have been prevented if the employer had ensured that the bundles of lumber were adequately secured in the hold and had provided sufficient dunnage to support the cargo in the event that a piece of dunnage breaks. Additionally, the hazard could have been prevented by ensuring that employees were adequately trained in hazard recognition and the work practices required to safely perform their jobs. For example, pre-job meetings could have been held to discuss the safe work practices required for a particular loading operation, including proper rigging, positioning, and securing cargo.

Other Relevant Standards and/or Control Measures
Experienced supervisors, trained in accident prevention in accordance with 1918.98(b)(1), should oversee operations in the hold, recognize unsafe acts or conditions, and verify that the laborers followed safe work practices. For example, if an employee will be exposed to a crushing hazard, provide additional support or restraint for stowed material in those areas, such as, adding additional dunnage.

MATERIAL HANDLING ACCIDENTS

Summary No. 11 - Unbalanced Dump Truck Load

Hazard
Employees were exposed to the hazard of being crushed by a dump truck trailer bed that contained an unbalanced load.

Process Name
A dump truck is used to load scrap bauxite into barges.

Activity at time of incident:
A flagman was guiding a semi-trailer dump truck driver during the transfer of wet scrap bauxite from the truck into a barge.

Incident Description
Setting:
Longshoremen are transferring scrap bauxite (which has the consistency of wet, sticky clay) from a terminal storage area to a barge using a dump truck and a pan rigged to a crane. A bucket loader operator fills each dump truck with scrap bauxite at the terminal storage area. The dump truck driver then transports the load to the wharf, where a flagman directs the dump truck driver as he backs up to the edge of the wharf and aligns the truck with the barge. The driver raises the hydraulic bed to allow the bauxite to slide out the rear of the bed into a pan which is used to guide the material into the barge. The flagman stands between the crane and the driver's side of the dump truck to communicate with the truck driver.

Incident:
At the time of the incident, the flagman directed a tri-axle tractor-trailer dump truck into position at the edge of the wharf adjacent to the barge. Standing near the end of the trailer on the driver's side of the truck, the flagman then directed the dump truck driver to begin raising the hydraulic trailer bed. The trailer bed was raised about halfway when it began to sway from side to side and then tilted to the driver's side. The driver stopped raising the bed, and was about to warn the flagman, but the bed continued to tilt. The the flagman saw the truck bed turning over and attempted to run out between the crane and the dump truck, but the trailer bed flipped onto its side and fell on him. Had the victim remained where he was, or gone under the truck, he would not have been struck.

Relevant Factors:
The scrap bauxite had adhered to the top of the raised truck bed, rather than sliding out the bottom, causing the bed to become unbalanced as it was raised higher. The bauxite had also adhered to the bucket of the loader, and the bucket loader operator bounced the bucket over the trailer bed to break the bauxite loose while loading it into the dump truck.

The dump truck was found to be in good condition. The solid concrete wharf was level and in good condition.

Just prior to the incident, when the bed was raised about one-quarter of the way, the truck bed began to sway from side to side. However, this was a fairly common occurrence and therefore did not concern the driver.

In the week prior to the incident, the flagman had assisted in unloading more than 600 loads. Three different types of dump trucks were used in the operation, including a tri-axle dump truck, a dual-axle dump truck, and the tri-axle tractor-trailer truck involved in the incident. The trucks capacities were 82,500, 88,000, and 92,500 pounds, respectively.

Applicable Standards and Control Measures

The crushing hazard presented by the tipping dump truck could have been prevented by ensuring that the flagman was in a safe location away from the dump site. This hazard may also have been prevented by ensuring that the dump truck was evenly loaded with the scrap bauxite before the truck proceeded to the wharf for unloading.

Other Relevant Standards and/or Control Measures

1. 29 CFR 1917.27(a)(1): Personnel - Qualifications of machinery operators. "Only those employees determined by the employer to be competent by reason of training or experience, and who understand the signs, notices, and operating instructions and are familiar with the signal code in use shall be permitted to operate a crane, winch or other power-operated cargo handling apparatus, or any power operated vehicle, or give signals to the operator of any hoisting apparatus."

All employees involved in the operation, including the dump truck driver, the bucket loader operator, and the flagman, must be trained in hazard recognition and safe work practices, and are competent in the signaling instructions used during the operation in accordance with the above standard.