

DEPARTMENT OF TRANSPORTATION

**MARINE BOARD  
of  
INVESTIGATION**

M/V THORSTREAM (Nor.)

Explosion and fire with loss of life

Buffalo, New York, 2 June 1967

U.S. COAST GUARD MARINE BOARD of  
INVESTIGATION REPORT and  
COMMANDANT'S ACTION

ACTION BY  
NATIONAL TRANSPORTATION SAFETY BOARD

FIRE ABOARD NORWEGIAN MV THORSTREAM  
WHILE LOADING CARGO AT BUFFALO, NEW YORK  
June 2, 1967

ACTION BY NATIONAL TRANSPORTATION SAFETY BOARD

This accident was investigated by the United States Coast Guard under the authority of R.S. 4450 (46 USC 239) and the regulations prescribed by 46 CFR 136. The Marine Board of Investigation convened at Buffalo, New York, beginning June 6, 1967. A Member of the National Transportation Safety Board attended the proceedings. The Coast Guard report of the investigation of the accident and the Commandant's action thereon are included in and made a part of this report.

The National Transportation Safety Board has considered those facts in the Coast Guard report of this accident investigation pertinent to the Board's statutory responsibility to make a determination of cause. By publication of this report the Board does not adopt those portions of the Coast Guard report which are concerned with activities within the exclusive jurisdiction of the Department of Transportation and the Coast Guard.

The National Transportation Safety Board finds that the cause of this accident, involving the loading of oxidizing material, was inadequate supervision of the longshoremen working this cargo. There was a lack of specific knowledge on the part of ship and stevedoring company personnel and longshoremen as to the characteristic properties of this chemical and the caution to be exercised in handling it. This cargo was being handled in a careless manner and

without regard for the caution marked on the labels attached to each container.

Loss of life was due to the resultant fire when several drums fell into the port deep tank and their contents spilled. The source of ignition is unknown.

#### REMARKS

Both stevedoring company and shipboard supervisory personnel were aware of the "yellow label" category of the cargo, but neither was familiar with the specific properties of calcium hypochlorite nor the precautions to be taken in handling it. No instructions were given to the longshoremen by the stevedoring supervisory personnel concerning the hazards of the cargo and the proper handling precautions to be observed.

Factors which the Board considered to indicate that this cargo was handled in a careless manner are as follows:

1. Palletizing of the drums without adequate strapping or other positive restraint to prevent the drums from falling off the pallets during loading maneuvers.
2. Opening of only one-third of the hatch cover of No. 3 hold which allowed insufficient clearance for lowering the pallets into the hold safely.
3. Using inadequate procedures and insufficient personnel to position the sling loads over the hold opening and to lower the pallets to the deep tanks with the required degree of care.

4. Continuing the loading operation without removing the damaged and spilled drums from the starboard deep tank, which preceded the fatal load.

5. Dropping the drums from the pallets in a "guided fall" while unloading the pallets in the deep tanks.

The Board concludes that the longshoremen were not adequately informed concerning the practices necessary to handle this dangerous cargo safely, nor familiar with the meaning of the labels used for the various classifications of such cargo. Refilling of a drum with its spilled contents in the starboard deep tank prior to the accident is evidence that the warnings on the labels were ignored.

The Board also notes that the cover of a drum came off in the starboard deep tank while the drum was being unloaded from a pallet in a "guided fall." This drum fell from a height less than that specified in the test required by the regulations for hazardous materials. In addition, the test is conducted on a concrete floor whereas the drum which spilled fell on wood flooring, producing a less severe impact than specified by the regulations for drop tests. The cover was secured on the drum with a lever locking ring authorized by the Bureau of Explosives. The regulations permit the Bureau of Explosives, a nongovernment agency, to authorize the use of closing devices equivalent to the bolted ring type specified by the regulations.

The lever lock closing devices used on these drums were not adjustable for tension, as are the prescribed bolted type covers. Manufacturing variations affect circumferences of the lid, the rim of the drum,

and the clamp. An unfavorable combination of these variations could result in a loose cover and result in spillage or reduced resistance to opening on impact. The specified tests would not assure prevention of this condition unless tests were broadened to include the extreme range of manufacturing dimensions in the worst combination; as well as a means of insuring that the range did not change. While the spillage in the starboard deep tank cannot alone be considered as evidence that this was a causal factor in the fire, this accident has revealed a shortcoming which could have caused the fire and which could cause future fires.

The loading operation was under the supervision of stevedore personnel even though 46 CFR 146.02-17 specifies that dangerous cargo shall be handled or stowed on board vessels under the "...direction and observation... of a qualified person assigned for such duty. For foreign vessels, such person shall be an officer of the vessel assigned to such duty by the master." Noncompliance with this regulation did not directly cause this accident, but was symptomatic of lack of responsibility for supervising the loading operation, and a factor of carelessness.

Labels on the drums complied with the applicable Federal Regulations for oxidizing materials which warn "keep away from fire, heat, and open-flame lights; remove carefully the contents of broken packages; do not drop." Export labels marked "oxidizing agent" were also attached. Manufacturer's markings occupied the major surface area of these containers. In analyzing the information on the drums, the Board noted

that the general public probably would not understand such descriptive words as "oxidizing agents, powerful oxidant, combustible organic material," and could not be expected to assimilate the cautionary handling information on the drums. Longshoremen without proper training ordinarily cannot be expected to understand the potential hazards of dangerous cargo, with the present marking system. In this accident, most of the stevedoring personnel noticed the yellow labels, but did not know what oxidizing materials were, nor the inherent danger of the contents of the drums.

The Commandant remarked to the effect that it is inappropriate for the Marine Board of Investigation to make a conclusion in regard to the seniority system in force for the selection of longshoremen as various courts and other governmental agencies with primary jurisdiction are already involved in litigation and arbitration relative to waterfront hiring practices. The Safety Board considers it is appropriate for an accident investigation, including Marine Boards of Investigation, to inquire into and make conclusions concerning hiring and employment practices where a question of safety is involved. The responsibility of accident investigative bodies to seek accident prevention factors is not superseded by the actions taken by other agencies for other purposes.

The Board recognizes that implementation of recommendations (5) and (6) would require additional personnel and funds for the Department of Transportation. However, based on this accident, we feel the Department should have the capability of issuing special permits to

shippers who request authorization to deviate from existing Hazardous Materials Regulations, governing containers and closure devices for hazardous materials.

#### RECOMMENDATIONS

The Safety Board concurs in the recommendations of the Marine Board of Investigation as approved by the Commandant.

The Safety Board further recommends that: (1) the Department of Labor, working with appropriate stevedoring organizations, consider the implementation of an effective training program, and direct attention to existing regulation assigning responsibility to a qualified person to direct and observe the handling of stowage of dangerous articles aboard vessels; (2) the Department of Transportation study the present Federal labeling requirements for dangerous articles, and manufacturers' markings currently used, to insure that the average person handling the container is warned concerning handling, as well as inherent hazards of the contents; (3) the Coast Guard study and review the actual practice used to direct the loading of dangerous cargo on board ship. If the provisions of 46 CFR 146.02-17 are not being followed, or are not understood, consideration should be given to amending these regulations in order to define the responsibility for safety more precisely and to make this responsibility clear to all appropriate persons; (4) the Department of Labor, in coordination with the Coast Guard, consider the need for regulations to require specific cargo handling apparatus which would prevent dangerous cargo

from falling from sling loads. For instance, some of the equipment specified in 46 CFR 146.20-35 for handling explosives could be specified for use in handling other dangerous cargo; (5) the Department of Transportation reexamine the existing practice of delegating authority to nongovernmental organizations to perform regulatory functions such as the granting of authorizations and special permissions to deviate in some manner from the existing Hazardous Materials Regulations; and, (6) the Department of Transportation consider changing present procedures to require the Department to issue special permits to shippers who request authorization to deviate from the specific regulations concerning containers and closure devices, in lieu of authority presently delegated to nongovernmental organizations.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

Adopted this 17<sup>th</sup> day of May, 1968:

[REDACTED]  
Chairman

[REDACTED]  
Member

[REDACTED]  
Member

[REDACTED]  
Member

[REDACTED]  
Member



DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD

Address reply to  
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WASHINGTON, D.C.  
20591

'5943/THORSTREAM  
A-9 Bd  
6 FEB 1968

Commandant's Action

on

The Marine Board of Investigation convened to investigate the fire on board the Norwegian M/V THORSTREAM while loading cargo at Buffalo, New York on 2 June 1967 with loss of life

1. The record of the Marine Board of Investigation convened to investigate subject casualty has been reviewed and the record, including the Findings of Fact, Conclusions and the Recommendations, is approved subject to the following comments and final determination of the cause of the casualty by the National Transportation Safety Board.

2. At or about 0850 EDST on 2 June 1967 while the Norwegian M/V THORSTREAM was in the Port of Buffalo, New York loading cargo, a fire resulting in the death of four longshoremen occurred as a pallet of steel drums containing a calcium hypochlorite compound was dropped as the pallet was being lowered into number three port deep tank. Dry calcium hypochlorite compounds are classified oxidizing materials by 46 CFR 146.22-200, Table E. Table E requires a yellow shipping label and gives the required conditions for transportation. When the material is heated to a temperature of 350 degrees F. a self-sustaining decomposition will be initiated with consequent evolution of heat, oxygen, and a fine white powder resembling smoke. The oxygen produced will greatly increase the burning rate and intensity of flammable and combustible materials.

3. The M/V THORSTREAM, a 479 foot freight vessel of 5,754 gross tons was scheduled to load part of the cargo consisting of seven thousand drums of the calcium hypochlorite compound, weighing one hundred pounds each, into number three deep tanks. Number three hatch was fitted with a conventional cover with three rows of hatch boards. Only the after row of hatch boards was removed to load the cargo. This provided an opening of 8.7' by 22.3'. The openings of number three port and starboard deep tanks located at the 'tween deck level measured 7.7' by 9.2'. Standard pallets measuring 4' by 6' were used to load the cargo.

4. The longshoremen commenced loading at 0820. Each pallet held twenty drums. The pallets were lowered alternately into the port and starboard

deep tanks. Although there was conflict in the testimony regarding the exact sequence of loading, the events are, for the purpose of this investigation, adequately described in Findings of Fact 16-18. Essentially it was found that the first draft was lowered into the starboard #3 deep tank and that the second draft was lowered into the port #3 deep tank without incident. As the third pallet was being lowered into the starboard deep tank it caught on a structural member about two feet above the bottom of the tank. All of the drums were dumped off the pallet but no calcium hypochlorite was spilled. The second Mate, at the request of the longshoreman hatch boss, had the starboard boom repositioned slightly to correct the condition that led to the dumping of the third pallet load. Two lines were also attached between the wires of the sling to further assist in holding the drums on the pallet. Loading was resumed and, although the pallets tended to rotate, about two more loads were lowered alternately into the port and starboard deep tank without incident. As the drums were being removed from a pallet that had already been received in the starboard deep tank one of them struck the deck on its side and the lid came off, spilling approximately one-half of the contents on the bottom of the deep tank. The drum was set upright and most of the spilled material was scooped up and returned to the drum.

5. As the loading continued, one of the pallets (approximately the sixth) was not square with the main deck hatch opening and its corner caught on the hatch coaming. The load was raised and after several more attempts were made to lower it through the opening the pallet caught on the forward side of the main deck hatch opening and two drums fell from the after side of the pallet. At least one of these drums ruptured and spilled its contents as it struck the bottom of #3 port deep tank. The pallet tipped forward and two more drums fell. This was followed by the fall of several more drums from the pallet. As the third drum struck one of the drums already on the bottom of the deep tank and "skidded" away, flames and dense white smoke ensued from the pile of spilled calcium hypochlorite compound. Four men perished due to the fire in the tank. Ship's fire hoses were utilized to fight the fire until 0905 when the first unit of the Buffalo Fire Department arrived and assumed control. The fire was extinguished at 0943 by the use of water.

#### REMARKS

1. Concurring in the conclusions of the Board it appears that the probable cause of the casualty was a reaction of the calcium hypochlorite compound which was dropped and spilled during cargo loading operations. It is considered, however, that the spillings were due to carelessness and lack of supervision rather than inadequate longshoring experience and training. The record would support a conclusion that the drums of calcium hypochlorite compound were properly marked as yellow label cargo and that information concerning its hazards was available to supervisory personnel. Present regulations require that dangerous cargo "shall be handled or stowed on board vessels under the direction and observation of a qualified person assigned to such duty."

2. With respect to conclusion 5, there is no evidence in the record that anyone was smoking in the deep tanks or that a lighted cigarette was present in number three port deep tank. While a burning cigarette, had there been one present, was a possible source of ignition for the fire there are other equally possible causes. Therefore the essence of conclusion 5 is that a specific cause of the fire cannot be determined.

3. The conclusion of the Marine Board of Investigation in regard to the seniority system in force for the selection of longshoremen for a particular cargo handling operation is inappropriate in this case as various courts and other governmental agencies with primary jurisdiction are already involved in litigation and arbitration relative to waterfront hiring practices.

4. The conclusions concerning the heroic efforts of fireman [REDACTED] in extinguishing the fire and of Mr. [REDACTED] in aiding his fellow workers are concurred in. Their actions will be made the subject of letters of commendation.

#### ACTIONS CONCERNING THE RECOMMENDATIONS

1. A copy of this report will be furnished the U. S. Department of Labor as proposed in Recommendation 1. It should be noted, however, that Coast Guard Regulations, 46 CFR 146 - 147, as well as Department of Labor Regulations, contain rules pertaining to the handling of cargo. Advisors and interested parties from both the Coast Guard Hazardous Materials Division and the U. S. Department of Labor were present at the Marine Board of Investigation and additional consultations have been undertaken.

2. Studies to further ascertain the characteristics of calcium hypochlorite compounds have been initiated in accordance with Recommendation 2. It should be noted, however, that the dangers associated with dropping of drums of the calcium hypochlorite compound were quite adequately set forth on the drum labels as well as in Coast Guard Regulations.

[REDACTED]  
P. E. TRIMBLE  
Vice Admiral, U. S. Coast Guard  
Acting Commandant



DEPARTMENT OF TRANSPORTATION  
~~TREASURY DEPARTMENT~~  
UNITED STATES COAST GUARD

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5943 BUF 07/67  
4 August 1967

From: Marine Board of Investigation  
To: Commandant (MVI)

Subj: Norwegian M/V THORSTREAM (no official number); fire on board  
while loading cargo at Buffalo, New York on 2 June 1967, with  
loss of life

FINDINGS OF FACT

1. At approximately 0850 EDST on 2 June 1967 while the Norwegian M/V THORSTREAM was loading a cargo of drummed calcium hypochlorite, a violent fire of short duration occurred in #3 port deep tank. As a result, four (4) longshoremen lost their lives. Three (3) other longshoring personnel received minor injuries. Damage to the vessel is estimated at \$300 with an additional estimate of cargo loss during the fire of \$1000.

2. The M/V THORSTREAM (no official number) is a freight vessel 479.15 feet in length, 61.15 feet in breadth and 25.8 feet in depth. Her tonnage is 5754 gross and 3151 net. She is a single screw motor vessel of 7000 horsepower built in Sandefjord, Norway in 1960. The vessel is owned by A/S Odd, Aktieselskabet, "Ornen," Skipsaktieselskapet Thorsholm and is operated by A/S Thor Dahl, both of Sandefjord, Norway. The master at the time of the casualty was [REDACTED] age [REDACTED] who holds a current unlimited Master's License issued by the Norwegian government. The Safety Equipment and Safety Construction Certificates issued to the vessel pursuant to the provisions of the International Convention for Safety of Life at Sea 1960 were prepared by the Norwegian Director of Shipping and Navigation and were not due to expire until 26 May 1968 and 31 January 1970, respectively. The Norwegian government requires a complete inspection of cargo handling equipment every four (4) years, with interim annual inspections by ships' officers. The last inspections conducted pursuant to these requirements were on 5 March 1964 and 26 February 1967, respectively. The American agents for the vessel were Kerr Steamship Company, Inc., 29 Broadway, New York, New York 10006 who were represented locally by Lancaster Steamship Agency, Inc., 901 Fuhrmann Blvd., Buffalo, New York 14203.

3. The deceased longshoring personnel are:

Robert R. Conrad, [REDACTED]  
Next-of-kin - Mrs. [REDACTED] Wife, same address.

Paul D. Cook, [REDACTED]  
Next-of-kin - Mr. [REDACTED] Father, same address.

Henry J. Janora, [REDACTED]  
Next-of-kin - Mrs. [REDACTED] Wife, same address.

Paul W. Smith, [REDACTED]  
Next-of-kin - Mrs. [REDACTED] Wife, same address.

4. The injuries sustained by three (3) longshoremen as a result of this fire were caused by smoke inhalation and resulted in periods of hospitalization ranging from two (2) hours to a maximum of two (2) days.

5. The weather at the time of the casualty was clear and calm with partly-cloudy skies and a temperature of 63°F. As the cargo involved in this casualty was stored in the open commencing on 23 May 1967, following is a resume of the weather from then until the occurrence of the casualty:

<u>Date</u>	<u>Sky</u>	<u>Temperature (F)</u>	
		<u>Maximum</u>	<u>Minimum</u>
5/23	Clear	67°	35°
5/24	Cloudy	72°	49°
5/25	Clear	81°	51°
5/26	Clear	80°	45°
5/27	Cloudy	75°	47°
5/28	Cloudy	73°	58°
5/29	Cloudy	67°	47°
5/30	Clear	75°	43°
5/31	Clear	80°	42°
6/1	Cloudy	76°	44°

During the entire period, there was only .03" of rain, which occurred as a light drizzle on 27 May. During storage at the terminal, the stack of drums was completely covered with a protective layer of clear plastic sheeting.

6. At about 0620, 2 June 1967, the M/V THORSTREAM arrived at the Buffalo Port Terminal, Buffalo, New York and moored port side to the wharf at the inner end of the south slip. She was scheduled to load 7000-100 pound drums of calcium hypochlorite consigned to General Chemical Corporation, Ltd., P.O. Box 21, Jacobs, Natal, South Africa via the port of Durban, South Africa. The shipper of this cargo was Olin Mathieson Chemical Corporation, 745 Fifth Avenue, New York, New York 10019, and it had been manufactured in their plant at 2400 Buffalo Avenue, Niagara Falls, New York 14303. This cargo was scheduled for stowage in number 3 port and starboard deep tanks and on the weather deck between number 4 and 5 hatches. The stowage of this cargo in the deep tanks met the requirements of Title 46 Code of Federal Regulations, Section 146.22-200 as long as it was not overstowed.

7. Immediately prior to arriving in Buffalo, New York, the ship's crew cleaned the #3 deep tanks in preparation for the loading of cargo, and a quantity of wooden dunnage was all that remained in each tank. They did not, however, clean under the wooden flooring of the tanks. The two (2) tanks were identical and of conventional construction with oil-tight hatch covers which were hinged along the after coaming of the tank opening at the tween deck level. The tank openings measured 7.7' fore and aft by 9.2' athwartships. The bottom of the tanks were 26' below the tween deck level, and their horizontal dimensions were 20.7' fore and aft by 29' athwartships. A fixed vertical steel ladder extended down the forward side of each tank from the tween deck level to the bottom of the compartment. The height of the tween deck compartment at the deep tank openings was 10.4'. On 10 December 1966 at Point Natal, South Africa, the entire interior of both tanks was scraped and wire brushed and a coat of Gamacoat Rust Preventative Coating #62-1 was applied to all surfaces. This is an organic petroleum base coating manufactured by the Gamlen Chemical Company whose main office is at 321 Victory Avenue, South San Francisco, California. It is used to protect metal surfaces against corrosion. Each deep tank was equipped with steam coils which were located at the bottom of the tank and were protected by a rough fixed wooden flooring which covered the entire bottom of the tank. There was no source of steam for the coils in operation on the vessel at the time of the casualty. The flooring was fabricated of rough planks with spaces between adjacent planks. There was a space of approximately 10" between the underside of the flooring and the bottom of the tank. Each tank was equipped with an outlet for a carbon dioxide fixed fire extinguishing system. Fixed piping at the top of the after bulkhead of each tank permitted the flooding of the compartments with water. Neither the fixed fire extinguishing system nor the flooding system were used during the fire. Each tank was connected to the ship's pumping system for handling

liquid cargo or de-watering the compartment. On 11 February 1967, a cargo of 507 drums (approximately 100 tons) sodium chlorate was loaded in the number 3 port deep tank at St. John, New Brunswick, Canada, consigned to Durban, South Africa. There is no evidence of damage to any of the drums or spillage of their contents during the time this cargo was on board the THORSTREAM. Sodium chlorate is shock sensitive.

8. Number 3 main deck hatch had a conventional cover consisting of beams, three (3) equal tiers of hatch boards, tarpaulins, battens, and wedges. The hatch opening measured 28.8' fore and aft by 22.3' athwartships, and the coaming was 3' high. The after edge of the hatch coaming aligned vertically with the after coaming of the tween deck deep tank hatches. At the center of the aft main deck hatch coaming, a fixed vertical steel ladder extended down to a narrow catwalk between the coamings of the tween deck deep tank hatch openings. The ship's crew, in preparing the main deck hatch to receive the cargo in the deep tanks, had folded the tarpaulins forward only far enough to expose the after tier of hatch boards, all of which were removed. The hatch boards were 9.2' in length, and discounting the landing flanges on the hatch beam and coaming, a maximum clear fore and aft opening of 8.7' for the full width of the hatch was provided.

9. In preparation for the loading of cargo into the number 3 deep tanks, the ship's crew had rigged the cargo booms. The head of the starboard boom was spotted approximately over the center of the starboard deep tank hatch opening, and the head of the port boom was approximately directly athwartships of the head of the starboard boom and spotted over a point about 10' out from the ship's side. At no time during the handling of this cargo at number 3 hatch was any difficulty experienced in the operation of the ship's cargo handling equipment.

10. The Buffalo Port Terminal, 901 Fuhrmann Blvd., Buffalo, New York 14202 is owned by the Niagara Frontier Port Authority, 1700 City Hall, Buffalo, New York 14202, a New York State Agency, and is operated under a lease agreement by Pittston Stevedoring Corporation, 17 Battery Place, New York, New York 10004. During conferences and in correspondence between the Captain of the Port, Buffalo, New York and officials of the Niagara Frontier Port Authority commencing in October 1964 concerning the requirements for the operation of the Buffalo Port Terminal as a facility designated for the handling of dangerous cargo, at no time was any mention made of the fact that Pittston Stevedoring Corporation held a five (5) year operating lease agreement on the terminal which gave them complete control of the facility. The current agreement expires on 30 September 1967. Even when cited for violation of Title 48 U.S. Code Section 191 for having phosphorus pentoxide, an oxydizing material, stored on the premises on 31 May 1966 contrary to the provisions of Title 33 Code of Federal Regulations, Subpart 126.13(b), the officials of the Niagara Frontier Port Authority made no mention of the operating lease agreement. This fact came to

light for the first time during the preliminary investigation of this casualty. This terminal is a modern concrete and timber wharf with marginal berths on the south and west sides. The warehouse building is a modern fireproof masonry structure with sprinkler installations throughout. It is the only general cargo terminal in operation in the port of Buffalo. Because of incompatible occupancy consisting of a large truck garage within the building, the terminal cannot meet the requirements for a facility designated to handle dangerous cargo as set forth in Title 33 Code of Federal Regulations, Subpart 126.15. Written notification of the receipt of this cargo of calcium hypochlorite was furnished to the Captain of the Port, Buffalo, New York by the Niagara Frontier Port Authority under date of 23 May 1967 as required by Title 33 Code of Federal Regulations, Subpart 126.27(b)(4). Considering the garaging of trucks within the terminal building, which is contrary to the provisions of Title 46 Code of Federal Regulations, Subpart 126.15(d), a special waiver for storage and handling of this particular cargo on the facilities of this terminal was granted by the Captain of the Port, Buffalo, New York to the Niagara Frontier Port Authority under the provisions of Title 33 Code of Federal Regulations, Subpart 126.11 with the understanding that cargo was to be stored in a protected area in the open well clear of any structure. Through a misunderstanding on the part of the operator of the terminal, Pittston Stevedoring Corporation, the first truck load of cargo was being moved into the warehouse when it was observed during a routine inspection by personnel of the Captain of the Port, Buffalo, New York. When the special requirements for the storage of this cargo were conveyed to the Pittston Stevedoring Corp. Pier Superintendent, it was immediately moved and stored in an open fenced area southeast and well clear of the warehouse structure. Neither [redacted] nor [redacted] who were Manager and Pier Superintendent, respectively, of the Buffalo office of Pittston Stevedoring Corp., were aware of the provisions of Title 46 Code of Federal Regulations, parts 146 - 149, and the application of these regulations to their organization in the handling of this cargo.

11. This cargo was a product manufactured and sold under the registered trade name "HTH." It is granular in form, and an analysis of a representative sample of this product revealed the following content:

Calcium Hypochlorite	71.50%
Sodium Chloride	21.53%
Calcium Chlorate	0.97%
Calcium Hydroxide	1.71%
Calcium Carbonate	1.61%
Calcium Chloride	1.95%
Iron	0.02%
Water	0.71%

Of these ingredients, calcium hypochlorite is a strong oxydizing material. It is used in swimming pools and industrial applications. Water treatment and purification constitute its primary application. The product was packaged in steel drums manufactured to meet the requirements of Interstate Commerce Commission specification 37 A 120. Such containers meet the packaging requirements for this product as set forth in Title 46 Code of Federal Regulations, Section 146.22-200. The drums each contained 100 pounds of the product and had a gross weight of 110 pounds, and were labelled to meet the requirements of Title 46 Code of Federal Regulations, Paragraph 146.05-17(g) and the International Convention for Safety of Life at Sea 1960, Chapter VII, Regulation 4. The drums are made so that when stacked their bottoms fit loosely into a recess in the cover of the drums below. The drum lid is secured in place by a lever-actuated metal ring of concave section which fits over the top flange of the drum and the edge of the lid. The locking device on the ring is secured with a light wire clip to preclude accidental opening. The sealing of the drums is so designed to obviate pressure build-up within the drum through the evolving of gas from the contents under all normal conditions; however, if a large quantity of gas was emitted from the contents, the normal "breathing" of the lid could not cope with the sudden rise in pressure, and the lid would most probably be blown off. In storage, this product in this case gives off small quantities of oxygen in the normal course of slow decomposition. The rate with which oxygen is evolved increases very slightly with increase in temperature; however, when a temperature of 350° - 355°F. is reached, a violent self-sustaining reaction occurs during which 16% oxygen by weight is liberated and the reaction continues until the entire mass is involved. Calcium hypochlorite itself is non-combustible and is reputed not to be shock sensitive nor reactive to a spark. It will react with varying degrees of rapidity with organic substances and corrosive liquids. Approximately one-half of the product in this cargo was manufactured late in 1966 and the remainder in May of this year.

12. Commencing on 23 May 1967, the drums comprising this cargo were delivered to the Buffalo Port Terminal by trucks from the plant where it was manufactured. The final delivery was effected 1 June 1967. The cargo was not palletized when delivered, and this was accomplished as it arrived at the Port Terminal. When the first truck load was delivered, [REDACTED] Pier Superintendent for Pittston Stevedoring Corp., in view of his responsibility in this respect, determined how the drums were to be palletized, and, in fact, loaded the first pallet with the assistance of a longshoreman helper. Standard new clean pallets measuring 4' x 6' were used. Twenty-four (24) drums were placed

symmetrically on each pallet in two (2) tiers of twelve (12) drums each. A strip of adhesive glass strand reinforced acetate film tape identified as Permacel 162 manufactured by Johnson & Johnson, New Brunswick, New Jersey was placed around the perimeter of the top tier of drums near their top to hold them steady. The specifications of this tape indicate a tensil strength of 375 pounds per inch of width with pro-rated reduction for sizes smaller than one inch; its impact strength is 75 pounds. Initially, 1/2" width tape was used, but when that was used up, 3/4" width was substituted on subsequent pallet loads. This tape and the loose interlocking of the drum bases and lids, as previously mentioned, were the only methods by which the pallet loads were secured together. There was no means used to secure the drums to the pallet. After the first pallet was loaded by the Pier Superintendent, subsequent palletization of the cargo was accomplished by the driver and helper of the truck that delivered the drums to the pier. Such palletization was done under the supervision of various personnel employed by Pittston Stevedoring Corp.

13. With only one general cargo terminal operating in the port of Buffalo and relatively little shipping traffic handling cargo of this nature, the employment and experience of longshoring personnel in the port is more casual than in other ports of comparable size. Work with cargo of this type is highly sporadic and, as a result, for the majority of persons engaged in general cargo longshoring work in the port of Buffalo, this employment constitutes a second job. Longshoremen are hired through the medium of the "shape-up." Personnel desiring employment call a telephone number of the International Longshoremen Association, Great Lakes District Local #928, and receive a recorded announcement of the employment available. Such recordings are placed on the line at 1700 for employment available on the following morning, and at 0900 for longshoring personnel needed to commence work at 1300 the same day. Pittston Stevedoring Corp. has entered into a contract agreement with the above union local, and by the terms of this agreement, union members receive employment preference. Persons desiring employment appear for the "shape-up" at the time and place indicated in the recorded announcement. Union members bid the various jobs available which are assigned on the basis of seniority, regardless of the individual's experience or capability. There is no training program available in the Buffalo area for persons engaged in longshoring work. If, after all union personnel have been hired at a particular "shape-up," there are still jobs unfilled, then non-union men are hired until all personnel requirements are satisfied.

14. At 0720, [REDACTED] Pier Superintendent for Pittston Stevedoring Corp. went on board the THORSTREAM to find out where the cargo was to be stowed. While on board, he looked down into the #3 deep tanks from the main deck, but did not actually go down into the tanks.

15. As Norway has ratified the International Convention for Safety of Life at Sea, 1960 pursuant to Chapter VII, Regulation I(d) of the terms of the convention, she is required to issue detailed instructions on the safe packing and stowage of specific dangerous goods or categories of dangerous goods, including any precautions necessary in their relation to other cargo. The Master of the THORSTREAM stated that a copy of the publication published pursuant to this requirement was on board the vessel; however, he further stated that neither he nor any of his officers had consulted the publication in preparation for the loading of this cargo.

16. At 0745, 2 June 1967, the "shape-up" for longshoring work on the THORSTREAM took place. Two (2) gangs were hired: one to load cargo in #3 hatch and the other to load cargo on deck in the vicinity of hatches #4 and #5. No instructions or cautionary information was given to any of the men concerning the cargo they were to load. The gang for #3 hatch consisted of twenty (20) men, twelve (12) of whom were on board the vessel initially and the remainder were on the dock. The gang went on board the vessel at approximately 0815. Personnel were assigned as follows:

Hatch Boss  
Winch Operator  
" "  
Signalman  
Longshoreman  
"  
"  
"  
"  
"  
"  
Extra Longshoreman  
"  
Dock  
"  
Driver (Dock)  
"  
Checker (Dock)  
Relief Man (Dock)

[REDACTED]  
Paul D. Cook

[REDACTED]  
Robert R. Conrad  
Paul W. Smith  
Henry J. Janora

For Janora and Smith, this was their first venture into work as long-shoremen. Four (4) men went down into each deep tank. Determination as to which tank to go into was elected by the individual, and no one was assigned in a supervisory capacity in either of the tanks. Conrad, Cook, Janora and Smith went into the port tank, and Brasseur, [redacted], [redacted] and [redacted] went into the starboard tank. [redacted] and [redacted] were designated on the dock to affix the labels to each drum as required by the International Convention for Safety of Life at Sea 1960, Chapter VII, Regulation 4. They were shortly reassigned to do this job in the deep tanks as they did not have access to the inner drums on the pallets. [redacted] went into the starboard deep tank, but before [redacted] got down into the port deep tank, he was directed to remain in the tween deck area to guide the pallets of cargo down into the deep tanks. The hatch boss looked down into the deep tanks from the main deck, but did not go down into the tanks at any time prior to or during the loading of cargo. It is not possible to see all areas of the deep tanks from on the main deck due to the relatively small size of the tank hatch openings. Immediately following the assignment of jobs at the "shape-up," those men designated as drivers commenced moving the pallets of cargo from its storage area about 300 yards from the ship to a position adjacent to the points from which it was to be loaded aboard the vessel. When the longshoring personnel went aboard the vessel, #3 hatch had already been opened and the cargo booms positioned and rigged by the ship's crew as previously described. The hatch boss did not consider any changes warranted at this time. Almost immediately after the arrival of the longshoring personnel on board, loading commenced at #3 hatch with the first pallet load going into the starboard deep tank at 0620. The pallet sling used consisted of two (2) loops of 1/2" wire joined at the yoke plate with a spreader bar of 3" x 4" hardwood of a length to just span the 4' edge of the pallet, affixed along the opposite side of the loops from the yoke plate. Identical spreader bars were clamped to the wires approximately 7' above the lower spreader bars. Loading in the way of hatches #4 and #5 was delayed by a fouled cable on one of the deck winches and, in fact, was never started. The second pallet load was lowered into the port deep tank. When the second pallet load (third to come on board) was being lowered into the starboard deep tank, it caught on one of the bulkhead stiffeners when about 2' above the bottom of the tank, and all of the drums were dumped off the pallet. None of the drums ruptured as a result of this incident. At this point, the Second Mate, Ole Fjellstad, who was on watch on deck and was observing the loading of the cargo, was requested by the hatch boss to reposition the starboard boom slightly to correct the condition which led to the dumping of the third pallet load. The request was immediately complied with. At this time, two pieces of 3/8" diameter line were attached between the wires of the pallet sling on the same sides as the spreader bars and about two-thirds of the way up the

height of the top tier of drums to further assist in holding the drums on the pallets. Loading was resumed with the fourth and fifth pallet loads being lowered into the port and starboard deep tanks respectively without incident. When the third pallet was received in the starboard deep tank, it was landed on top of the empty pallets of the two preceding loads. In the starboard deep tank, the method of removing the drums from the top tier consisted of tipping the drum and allowing it to descend to the deck on its side in a guided fall from which point it was rolled to its location of stowage where it was again stood upright. The labelling on drums contained the admonition "DO NOT DROP, ROLL OR SKID." As [REDACTED] removed the first drum from the top tier of the third pallet received on the starboard deep tank, the lid came off as it struck the deck on its side. Approximately one-half of the contents of the drum spilled out onto the bottom of the deep tank with a portion filtering down between the openings in the wood decking which covered the bottom of the compartment. [REDACTED] immediately set the drum upright and commenced scooping up the spilled material, using the drum lid and the special measuring cup which was contained in the drum. He was not able to retrieve that portion of the spilled material which had found its way through the openings of the wooden flooring, which amount was estimated at about ten percent of that which had spilled. This incident was not reported to anyone. The labelling of drums contained the warning, "DO NOT CONTAMINATE WITH ANY FOREIGN MATTER."

17. The sixth pallet load to come on board was destined for stowage in the port deep tank. When attempting to lower it through the main deck hatch opening, it was not square with the opening, and a corner of the pallet caught on the edge of the after coaming of the hatch. The load was raised and another attempt was made to lower it through the opening with the same result. After this was done several times without success, [REDACTED] the signalman, pushed the pallet forward to clear. When the load was within sight of both winchmen, they controlled the load without direction from the signalman. The diagonal dimension of the pallet was 7.2', and as previously stated, the clear fore and aft dimension of the main deck hatch opening was 8.7'. At this time, [REDACTED] the ship's electrician, was looking out one of the ports in his room on the main deck immediately aft of #3 hatch. He had the pallet in full view, and it was forward and slightly to starboard of his position and distant about 10'. [REDACTED], from his position on the outboard side of the starboard #3 deep tank, was watching the pallet being lowered through the hatch opening. [REDACTED] saw the forward corner of the pallet catch on the forward side of the main deck hatch opening and two (2) drums fall from the after side of the pallet. [REDACTED] saw the pallet tip towards him and two (2) drums fall towards him from the pallet; these were followed by an indeterminate number of

additional drums. Both men reported seeing smoke issuing from the hold immediately following the fall of the drums. This occurred at about 0850. As the drums fell, a warning to the men in the hold was shouted by Diehl, the hatch boss. There is no indication that any of the men in the #3 port deep tank were hit by falling drums. At least one of the first drums to fall was seen by Diehl and Cooley to rupture and spill its contents as it struck the bottom of the port deep tank. [REDACTED] stated that as the second drum landed in the bottom of the tank, the third falling drum struck it side to side and skidded off. There was an immediate ball of flame described as being about the size of a basketball. Projecting the deep tank hatch opening to the bottom of the tank, the drums were seen to land in approximately the center of this area and did not strike anything on the way down. Both men saw the whole pile of spilled calcium hypochlorite in flames which was followed by dense white smoke. Several witnesses in the area described the sound heard at the inception of the fire as "Pouff" and "Whoosh." At this time, persons in the area heard the frantic unintelligible screaming of the men in the port deep tank which lasted only a relatively short period of time. With the first evidence of fire, Diehl shouted, "Fire in the hold," and left the ship to turn in the alarm; however, it was determined that [REDACTED] had already called in the alarm by telephone. At this time, Captain [REDACTED] who was in his office, heard shouting and screaming on deck. His office is located in the after starboard side of the superstructure, immediately forward of hatch #3 and on the second deck above the weather deck. He immediately ran to the open deck on the after side of the forward superstructure from which he had a full view of hatch #3. He saw a pallet hanging approximately two (2) feet above the top of the hatch coaming and centered about in the middle of the hatch opening athwartships. The pallet was hanging stationary in an area of dense smoke but was plainly visible at times. There was an undetermined number of drums still on the pallet, and one edge of the pallet was burning. After determining that the Buffalo Fire Department had been called, he proceeded to the main deck area of #3 hatch. At this time, the ship's crew and longshoring personnel were taking action to fight the fire. Two (2) hoses were broken out and streams of water were directed down into the hold. At no time was the fire alarm sounded on the vessel. At 0905 the first unit of the Buffalo Fire Department arrived on the dock and took over the fighting of the fire.

18. With the first indication of fire, the men in #3 starboard deep tank made their way up into the tween deck area which, by that time, was filled with smoke. [REDACTED], whom it was previously mentioned, was stationed in the tween deck area seeing drums tumbling off the pallet, stepped backward away from #3 port deep tank hatch opening. He

heard the cry of "Fire!", and, glancing into the compartment, saw smoke near the bottom, at which time flames erupted in the tank which increased until it was estimated they extended above the tank opening to a height of 4'. Accompanied by [REDACTED], he then ran forward, looking for a way out, and finding none he turned back from whence he had come. In this short interval, the flames had already subsided from their original intensity, on which basis he decided to make a break for the ladder located between the deep tank hatches. He succeeded and had no difficulty gaining the safety of the main deck. He was followed shortly by [REDACTED]. Meanwhile, the members of the ship's crew, assisted by longshoring personnel, opened the forward end of #3 main deck hatch, and a Jacob's ladder was dropped down into the tween deck area from the starboard corner. [REDACTED] and [REDACTED] made their way out of the tween deck area via this ladder.

19. Hearing the cry of "Fire" on the THORSTREAM, [REDACTED], a longshoreman who was working on the dock adjacent to the ship astern, immediately made his way on board the THORSTREAM. Ascertaining that there were men trapped in the hold and quickly sizing-up the situation, he obtained one of the ship's self-contained breathing units and descended via the previously-mentioned Jacob's ladder into the tween deck area. He descended the ladder immediately after [REDACTED] and [REDACTED] came up. He groped his way aft in the dense smoke which was particularly hazardous as he was completely unaware of the layout of the hold, and he did not know if there were any open hatches. He found [REDACTED] when he stumbled over his prostrate form. At this point, [REDACTED] was semi-conscious. He helped [REDACTED] to his feet, and peeling aside his face mask, shared his supply of air by having [REDACTED] place his face close to his. At this time, through the smoke, an empty pallet was seen hanging over the starboard deep tank. [REDACTED] helped [REDACTED] aft, and the pallet was lowered in response to their shouts. [REDACTED] helped [REDACTED] onto the pallet, and then he himself climbed aboard. As he climbed onto the pallet, [REDACTED] realized that his supply of air was exhausted, so he took off the mask. As soon as they were both aboard the pallet, it was raised to the main deck, and they were taken off, helped to the dock, and given oxygen to breathe while awaiting transportation to the hospital where they were treated for smoke inhalation over a period of two days.

20. Following the time when Captain [REDACTED] saw the partially-loaded pallet hanging over the main deck hatch opening and when [REDACTED] and [REDACTED] saw the empty pallet hanging over the opening of the starboard deep tank, [REDACTED] the second mate, was seen by [REDACTED] the starboard winch operator, to slack the port winch. [REDACTED] avoided making any reference to this action in his testimony. This action resulted in the swinging of the pallet to starboard and the dumping of the remaining drums from the pallet into the hold.

21. At 0858, Ladder Company No. 8 of the Buffalo Fire Department, located at 40 Ganson Street, the first unit on the scene, received the first alarm of the fire. This station is 1.1 miles from the Buffalo Port Terminal, and the unit arrived on the scene at 0905. A second alarm was subsequently turned in at 0915. Ultimately, there were 7 pumpers and 6 ladder trucks on the scene. As Ladder Company No. 8 arrived at the Buffalo Port Terminal, the officer in charge of the unit, Lt. [REDACTED], was informed by an unidentified person that there was chlorine gas involved in the fire. He accordingly ordered three (3) of his men to don self-contained breathing units. Other than the information alleging the presence of chlorine gas, Lt. [REDACTED] stated that when he commenced fighting the fire, he had no idea of the chemical that was involved. As soon as their first unit arrived on the scene, the Buffalo Fire Department took over the fighting of the fire. Lt. [REDACTED] immediately boarded the THORSTREAM with his men. At this time, he could not see any flames; however, there was dense smoke and heat pouring out of the hatch. He ordered a 24' ladder placed down into the port side of the hatch, and it was landed on the narrow catwalk between the deep tank hatch openings. Lt. [REDACTED] and his men then descended to the tween deck area. When they arrived in the tween deck area, Lt. [REDACTED] could hear the crackling of the fire, but still couldn't see any flames. Firemen [REDACTED], a former longshoreman, [REDACTED], equipped with self-contained breathing units, were then ordered into the port deep tank to reconnoiter the fire. [REDACTED] was in the lead, followed closely by [REDACTED] and [REDACTED]. They used the built-in steel ladder in the tank rather than one of their own. When [REDACTED] arrived at a point close to the bottom of the tank, he stepped off the ladder onto the lowest stringer of the forward bulkhead, and facing aft he could detect the glow of fire to his right. The heat was so intense as to almost make his position untenable. [REDACTED] then went down into the bottom of the tank where he was joined by [REDACTED]. A charged 2½" hose line had been lowered into the tank, but there was insufficient slack to enable them to handle it. When they called for more slack, they were given too much. They wrestled with the line, attempting to open the nozzle without success. [REDACTED] then noticed that he was getting low on air, and he returned to the tween deck area, leaving [REDACTED] alone in the deep tank. Neither [REDACTED] nor [REDACTED] ever went all the way down to the bottom of the tank. [REDACTED] continued to wrestle with the nozzle and finally succeeded in opening it. He directed it on the fire, which he recognized as a pile of dunnage located in the forward outboard corner of the tank. As soon as the water struck this fire, a dense cloud of smoke and steam were emitted, blocking Hennigan's view of the fire. He moved his hose to the left, and as he did so, he could hear what sounded like metal drums being blown around by the force of the water. The stream of water was

then returned to where it was originally directed, and the fire was extinguished. The fire was extinguished at 0943. At this time, [REDACTED], completely exhausted, shut off the nozzle and returned to the tween deck area. Exhaust fans were then rigged over the port deep tank to clear the compartment of smoke. In view of the fact that some of the men who had been trapped in the deep tank were friends dating from his former employment as a longshoreman, [REDACTED], after regaining his strength, requested permission to return into the tank. Permission was granted, and a 35' ladder was placed down into the tank from its forward coaming. On descending, [REDACTED] found two bodies burned beyond recognition laying on the bottom of the compartment. Two other badly burned bodies were found, one on the outboard end of the first bulkhead stringer above the bottom of the tank, and the other on the stringer above approximately halfway between the fixed ladder and the outboard side of the tank. All bodies were devoid of clothing and hair, with the exception of the ones found on the bulkhead stringers which each had portions of a shoe on one foot. When the body on the upper stringer was removed, a partially-burned wallet and a cigarette lighter were found under it. These were identified as belonging to Paul W. Smith. The bodies were removed to the County Morgue where they were identified and turned over to next-of-kin for burial.

22. At 0907, 2 June 1967, [REDACTED] a clerk in the Buffalo office of Pittston Stevedoring Corp., notified the Captain of the Port, Buffalo, New York by telephone of a fire on board the M/V THORSTREAM involving calcium hypochlorite. This information was relayed to the Coast Guard Base, Buffalo, New York at 0911. Following is a schedule of events of the activity of Coast Guard units in connection with this casualty:

- 0914 - CGC QUIBWA (WYTM-97) ordered to get underway from Base Buffalo for Buffalo Port Terminal.
- 0920 - Two (2) boarding petty officers and two (2) investigating officers dispatched to Buffalo Port Terminal by Captain of the Port and Officer in Charge, Marine Inspection, Buffalo, New York respectively.
- 0923 - CG-40507 departed Base Buffalo for Buffalo Port Terminal.
- 0924 - CG-30440 departed Base Buffalo for Buffalo Port Terminal.
- 0925 - Fire party with equipment departed Base Buffalo by vehicle for Buffalo Port Terminal.
- 0928 - Fire party arrived Buffalo Port Terminal.
- 0929 - CG-40507 arrived Buffalo Port Terminal.
- 0930 - CG-30440 arrived Buffalo Port Terminal.

- 0940 - Personnel from Captain of the Port and Officer in Charge, Marine Inspection, Buffalo, New York arrived at Buffalo Port Terminal.
- 0955 - CG-30440 ordered to return to Base.
- 1005 - CG-40507 ordered to return to Base.
- 1025 - Fire party returned to Base.

No assistance was rendered by Coast Guard units, as the fire was under control at the time they arrived on the scene. CGC OJIBWA never departed Base Buffalo, as the fire was extinguished prior to her getting underway.

23. Immediately following the casualty, the Erie County District Attorney's Office was requested by the Officer in Charge, Marine Inspection, Buffalo, New York to have autopsies performed on the bodies of the deceased so that, if possible, a determination could be reached on whether any of the men had been struck by falling drums. This request was agreed to, and the Coroner was directed to perform the autopsies. When the autopsy reports were not received after a reasonable period of time, on checking with the District Attorney's office, it was learned that the Coroner had taken it upon himself to not perform the autopsies as requested, as he considered the cause of death self-evident. The Certificates of Death indicate the cause of death in each case as general third degree burns.

24. After the fire was extinguished, some damaged drums of calcium hypochlorite were found in the tween deck area and starboard deep tank. In the starboard deep tank, one of the drums had ruptured and spilled its contents on the bottom of the compartment and the lowest forward bulkhead stringer. The bulkhead stringer in the area where the drum contents was spilled was coated with Gamakote 62-1. As late as twenty-eight (28) hours after the start of the fire in the port deep tank, this situation was observed by members of the Board, and it was particularly noted that no reaction had occurred in the pile of calcium hypochlorite as a result of this contact with the Gamakote-treated surface or the wooden flooring.

25. Of the men in the port deep tank, Smith and Conrad were known cigarette smokers, Cook was a non-smoker, and Janora's smoking habits are unknown. The Buffalo office of Pittston Stevedoring Corp. did not have any restriction against smoking anywhere but in the ship's hold, and Harmon, who was working on the dock handling cargo for number 3 hatch of the THORSTREAN, admitted smoking while so employed. There is no evidence that anyone was smoking in either of the number 3 deep tanks or the THORSTREAN prior to the fire.

26. Damage to the cargo as a direct result of the fire was confined to seventy-two (72) drums of cargo. Damage to the vessel was limited to the rough wooden flooring in the port deep tank.

27. With the advent of this casualty, the Captain of the Port, Buffalo, New York established liaison with the Buffalo Fire Department, and they are now alerted as far in advance as possible of the presence of dangerous cargos on board vessels in the port of Buffalo, and will, therefore, be in a position to determine in advance the safest and most effective means of coping with a fire in such a cargo.

### CONCLUSIONS

1. The primary cause of this casualty was the insecure method of palletization of the cargo coupled with the unsafe slinging procedures used in loading it on board the THORSTREAM.
2. The failure of the supervisory personnel of the Buffalo office of Pittston Stevedoring Corp. to fully determine the nature of the cargo to be loaded aboard the THORSTREAM and the Federal Regulation pertaining thereto, and to convey proper cautionary information to their longshoring employees who were to be handling the cargo contributed to the cause of this casualty.
3. The failure of the longshoreman hatch boss, [REDACTED] to exercise his prerogative to request the crew of the THORSTREAM to further uncover the main deck hatch opening to provide easier and safer passage of the drafts of cargo was a contributory cause of this casualty.
4. The absence of an organized instruction program other than on-the-job training for longshoring personnel in the port of Buffalo, New York, coupled with the seniority system in force for the "bidding" of the various available jobs in a particular cargo handling operation irrespective of the experience of the individual involved reflect adversely on the potential safe handling of cargo and are considered to be an indirect cause of the casualty.
5. On the basis of information adduced during this investigation, the specific cause of the fire cannot be determined. However, considering the known characteristics of the chemical involved, the instantaneous nature of the reaction in this case, and the conditions which were known to exist in the #3 port deep tank immediately prior to the fire, it is concluded that the combination of a source of ignition having a temperature in excess of 3500°F. and flammable material, such as a lighted cigarette, caused the reaction of the calcium hypochlorite and the fire which resulted.
6. The waiver of the provisions of Title 33 Code of Federal Regulations, Subpart 126.15(d) by the Captain of the Port, Buffalo, New York made the Buffalo Port Terminal capable of operation as a facility designated for the storage and handling of this particular dangerous cargo subject only to its special storage location considerations.
7. The storage of the cargo in the open at the Buffalo Port Terminal did not have any significant effect on the contents of the drums.

8. There is evidence of violation of the provisions of Title 33 Code of Federal Regulations, Subpart 126.15(b) by Pittston Stevedoring Corp. in permitting smoking in other than designated areas while dangerous cargo was present at the Buffalo Port Terminal. A report of violation has been submitted to Commander, Ninth Coast Guard District.

9. The failure of the master of the THORSTREAM to check the reference text published by the Norwegian government with regard to this particular cargo, the failure of the supervisory personnel of Pittston Stevedoring Corp. Buffalo office to consult the Dangerous Cargo Regulations and to adequately inform their longshoring personnel of the characteristics of this particular cargo, and the failure of the officers of the units of the Buffalo Fire Department which responded to the alarm to determine the chemical involved might have had disastrous consequences if the material had been incompatible with the means used to fight the fire.

10. [REDACTED] completely voluntary efforts to aid his fellow workers without any thought of his personal safety reflects heroism of the highest order. This matter will be the subject of separate correspondence from the Board.

11. The failure of the master of the THORSTREAM to sound the ship's fire alarm did not have any significant effect on the outcome of this casualty.

12. The performance of Fireman [REDACTED] in going down into the #3 port deep tank and prevailing unassisted in his efforts to extinguish the fire reflects a sense of duty of an extremely high order. This matter will be the subject of separate correspondence from the Board.

13. The failure of [REDACTED] to admit to the slacking of the port winch and the resultant dumping of the remaining drums from the pallet was caused by fear of jeopardizing the interests of the THORSTREAM in this casualty. His action in slacking the port winch is considered to have been proper, as it is concluded that it was done to remove remaining drums from the immediate area of the fire. There is no evidence that the falling of the remaining drums into the hold caused aggravation of this casualty.

14. The location of the fire at the time of its inception denied access to the built-in ladder of the deep tank, causing the men whose bodies were found on the tank bulkhead stringers to take to these stringers in their unsuccessful efforts to get out of this compartment.

15. Because of the rapidity with which the fire progressed from its inception and the high temperature involved, no possible action could have saved the men in the port deep tank.

16. The Coast Guard units which were ordered to the scene of the casualty responded in a timely manner; however, by the time they arrived at the THORSTREAM, the fire was under control and there was no need for their services.

17. There is no evidence that any personnel of the Coast Guard or any other Government agency contributed to this casualty.

#### RECOMMENDATIONS

1. That a copy of this report be furnished to the U.S. Department of Labor looking toward the possible formulation of changes in their regulations covering the handling of cargo, particularly dangerous cargo, and the establishment of a comprehensive training program for longshoring personnel.

2. That further studies be conducted to ascertain the complete characteristics of the product involved in this casualty with the idea of determining whether any changes would be warranted in Title 46 Code of Federal Regulations, Parts 146 through 149, as they pertain to calcium hypochlorite.

[REDACTED]  
FRANCIS J. FANN  
Commander, U.S. Coast Guard  
Chairman

[REDACTED]  
HUGH M. MCCREERY  
Lt. Commander, U.S. Coast Guard  
Member

[REDACTED]  
CHPOSN W-4, U.S. Coast Guard  
Member and Recorder