

# UNITED STATES COAST GUARD

ADDRESS REPLY TO:  
COMMANDANT  
U. S. COAST GUARD  
HEADQUARTERS  
WASHINGTON 25, D. C.



MVI  
(FREEPORT SULPHUR CO. NO. 20  
a-8 Bd)

7 JUL 1960

## Commandant's Action

on

Marine Board of Investigation; explosion and fire  
on barge FREEPORT SULPHUR CO. NO. 20, Avondale  
Marine Ways, Harvey, Louisiana, on 17 November  
1959 with loss of life

1. The record of the Marine Board of Investigation convened to investigate subject casualty, together with its Findings of Fact, Conclusions and Recommendations has been reviewed.
2. The FREEPORT SULPHUR CO. NO. 20 (FS-20) is a steel hull, non-propelled, open sulphur barge, the construction of which was completed in the latter part of October 1959. The barge consisted of a main cargo space through the center with wing tanks along each side plus forward and after rake tanks. All of these spaces with the exception of the main cargo space were coated with a grease type rust preventive. Atop the after rake were located the pumproom and a 5,000 gallon oil tank.
3. On 12 November 1959 the FS-20 arrived, without cargo, at the Avondale Marine Ways, Harvey, La., to undergo repairs to damage suffered in a minor casualty a week earlier and to have a new water sprinkling system installed. Before work began a gas chemist, certified by the American Bureau of Shipping, issued a gas-free certificate covering the entire hull structure and certifying it safe for men - safe for fire.
4. On the morning of 17 November 1959 yard personnel made preparations to cut a hole through the after bulkhead of the main cargo space into the center stern rake compartment to accommodate a 2" water line. An explosimeter reading in the center stern rake compartment taken by the yard's shipfitter foreman disclosed no dangerous gases. One of the workmen applied the cutting torch to the rust preventive coating on the ladder near the center stern rake manhole. The witnesses agreed that the material burned and melted while the flame was being applied but whether it went out of its own accord or whether the flame was blown out is not clear. In any case, none of the witnesses voiced any concern over the apparently combustible characteristics of this material; however, as a precaution it was agreed that the rust preventive would be

wiped from the bulkhead where the cutting was to take place. The pipefitter that was to do the burning entered the main cargo space and heated until red a 1/2" spot on the bulkhead to mark the location of the hole. Another workman entered the center stern rake tank and wiped the rust preventive from around the area with dry rags. Apparently no solvent was utilized. When the workman indicated that a large area had been cleared the pipefitter re-entered the main cargo space and commenced the actual burning. The other man stood by with a water hose on deck over the manhole to the center stern rake compartment. When the pipefitter had burned half-way around the circle he noticed little flames sputtering through the hole. He shut off the torch and immediately went upon deck. The other man was playing the hose through the manhole onto the bulkhead and stated that a fire had started and that he was unable to put it out. Seeing that the fire was intensifying and noticing a hissing sound emanating from the compartment the pipefitter suggested they get help then turned and ran from the barge shouting "fire." When he had reached a point about 15 or 20 feet away the hissing sounding increased to a "whoosh" followed by an explosion of great magnitude which in turn was followed a few seconds later by a second explosion of less force. The deck of the center stern rake was thrust upward and ruptured and the entire pumproom was blown from the barge onto the dock. As a result five men were killed including the workman who was attempting to extinguish the fire with the hose.

5. After the casualty, samples of the rust preventive taken from the wing tanks and forward compartments were tested and found to have a flash point of 90° F and a fire point of 130° F. A sample of the same material from the overhead of the compartment in which the explosion occurred had a flash point of 315° F and fire point of 615° F. The flash point and fire point of a sample taken from a new can of the product were both found to be 85° F. A brochure describing the product stated that the material contains solvent with minimum flash point of 100° F.

6. The weather at the time of the casualty was cloudy, wind north, 15-20 MPH, temperature 46° F.

7. The Board also determined that at the time the rust preventive had been applied by the shipyard after construction a thinner having a flash point of approximately 100° F was used to facilitate application.

#### REMARKS

1. Concurring with the Board it is apparent that the cutting torch set fire to the rust preventive which in turn released a large volume of gas so rapidly and violently that an explosion resulted. The second explosion, which occurred in the port stern rake compartment, was a direct result of the heat and fire in the center compartment.

2. The fact that the flash point of the rust preventive taken from the overhead of the center stern rake compartment was found to be 315° F can be accounted for by the fact that more volatile fractions would be vaporized out by the heat of the fire and explosion.
3. The Board's conclusion that the tests conducted by the certifying gas chemist prior to issuing the gas-free certificate were inadequate is also concurred in. The stated purpose of the regulation requiring an inspection of a compartment prior to making repairs involving riveting, burning, welding and so forth is to determine that such operations can be conducted with safety. By failing to properly test or otherwise familiarize himself with the characteristics of the rust preventive which coated the tanks the gas chemist did not properly discharge his responsibility before certifying that the hull structure was safe for fire, safe for men.
4. In accordance with the Board's recommendation a copy of this investigation will be forwarded to the American Bureau of Shipping for their review of present standards for the control of gas hazards aboard vessels. The need for additional regulations by the Coast Guard in this regard is under active consideration.
5. Publication of the hazards of using substances with low flash points in compartments aboard vessels, as further recommended by the Board, is not considered to be necessary. When the flash point of a substance is known the hazards will be apparent.
6. Subject to the foregoing remarks, the record of the Marine Board of Investigation is approved.

  
J. A. HIRSHFIELD  
Vice Admiral, U.S. Coast Guard  
Acting Commandant

UNITED STATES COAST GUARD

ADDRESS REPLY TO

Commander  
Eighth Coast Guard District  
New Orleans, Louisiana



JAN 12 1960

From: Marine Board of Investigation  
To: Commandant (MVI)  
Via: Commander, 8th Coast Guard District

Subj: FREEPORT SULPHUR CO. NO. 20; fire and explosion at Harvey, La.  
on 17 November 1959, resulting in loss of life of five men and  
extensive damage to vessel.

Findings of Fact:

1. At about 11:00 A.M. on 17 November 1959, a fire, immediately followed by an explosion occurred in the stern section of barge, FREEPORT SULPHUR CO. NO. 20, resulting in extensive damage to the vessel and the loss of five lives.
2. FREEPORT SULPHUR CO. NO. 20, (hereinafter abbreviated FS-20) O. N. 280042, is a steel, inspected, non self-propelled, unmanned, molten sulphur barge of 280' X 50' X 11.9'. Vessel was built at Todd Shipyard, Houston and completed in October 1959. Vessel is owned by Freeport Sulphur Company, 1600 Commerce Building, New Orleans, Louisiana. A general arrangement of vessel compartments is shown on attached sketch. At the time of this casualty FS-20 had molten sulphur in her cargo tanks, but this cargo and the compartment in which the cargo tanks are located had no bearing on this casualty.
3. Weather at the time of this casualty was as follows: cloudy; north wind, 15-20 MPH; temperature 46° F.
4. The persons who lost their lives as a result of this casualty are:

a. Jacob Aron Smith, Age [REDACTED]

b. Nolan P. Knoblock, Age [REDACTED]

c. Wiley Joseph Savole, Age [REDACTED]

d. Hubert J. Robert, Age [REDACTED]

e. Euclid J. Hebert, Age [REDACTED]  
[REDACTED]

5. All of the above deceased men were shipyard workers employed by Avondale Marine Ways, Inc. at Harvey, Louisiana, with the exception of Jacob A. Smith, who was a shore worker employed by vessel owners. One additional Avondale yardworker, [REDACTED] suffered minor burns as a result of this casualty.

6. As a result of this casualty, the entire stern section of FS-20 was damaged. The explosion caused the 14' X 24' pump engine room, located on the main deck aft, to be thrown off the vessel, landing upside down on the dock adjacent to the barge. Some damage to the lagging of the barge cargo tanks also resulted from this casualty, but the structural damage was mainly confined to the three stern rake compartments, the pump engine room located over these compartments and a 5000 gallon tank alongside the pump engine room.

7. FS-20 was completed in the latter part of October at Todd Shipyard, Houston, Texas. At that time, all of the vessel's compartments, with the exception of the main cargo space, were coated with a rust preventative called NO-OX-ID-A Special. (See brochure attached to record for description of this material) This material is basically a grease type rust preventative and it contains solvents with an advertised minimum of 100° flashpoint. An analysis of a new can of this preventative made in New Orleans showed the flashpoint to be 85° F. At the time NO-OX-ID-A Special was applied by Todd Shipyard personnel, a thinner known as varsol was also added to facilitate application. Varsol has a flashpoint of approximately 100° F.

8. On 12 November 1959, FS-20 arrived at the Avondale Marine Ways yard, located in Harvey, Louisiana for the purpose of repairing damages suffered one week earlier in a minor fire on the vessel and to have a new water smothering system installed. A preliminary inspection was made by CHBOSN [REDACTED], a marine inspector attached to the Marine Inspection Office, New Orleans. CHBOSN [REDACTED] issued a requirement to provide a certificate from a certified chemist stating that the barge was safe for men and fire. Later that day, the barge was tested by [REDACTED], Certified Chemist, ABS No. 352, who issued the gas free certificate attached to the record. Mr. [REDACTED] tested the vessel compartments using an electrical explosimeter and a Davy lamp. At that time, as a result of a complaint of odors in the after compartments, Mr. [REDACTED] entered these compartments and made visual inspection of the center and starboard stern rake compartments. At the completion of these tests, Mr. [REDACTED] issued the certificate.

9. On the morning of 17 November 1959, Avondale Marine Ways personnel were in the process of installing a water pipe line on the FS-20. This line was to run from the main cargo space through its after

bulkhead into the center stern rake and there up into the pump room. Inasmuch as welding and acetylene torch cutting were involved, a test by explosimeter was made of the center stern rake compartment by yard personnel. This test indicated that the compartment contained no dangerous gases. At the same time, a torch was applied to the rust preventative coating on the ladder near the center stern rake manhole. As a result of this flame, the coating was observed to burn and was blown out by the oxygen blast from the torch. One of the yard workers then went into the compartment to clean the rust preventative from the area of the bulkhead where cutting would be performed. This was accomplished by wiping the bulkhead with rags which were then removed from the compartment.

10. At about 11:00 A.M., [REDACTED], a shipyard employee, started to burn a hole in the after bulkhead of the main cargo space. [REDACTED] was cutting from this space into the center stern rake. Euclid J. Hebert, working with [REDACTED], was stationed by the manhole to that compartment. When [REDACTED] had completed approximately half of the circle he was cutting, he noticed fire on the bulkhead inside the rake compartment. [REDACTED] secured cutting and went up to the manhole over the compartment. There he found Hebert attempting to put out the fire on the bulkhead by directing a stream of water from a hose through the manhole. [REDACTED] observed that the fire was spreading rapidly and that the air was starting to rush out through the manhole causing a loud hissing sound. [REDACTED] left the barge to obtain assistance in putting out the fire. The hissing sound increased in intensity and was heard several hundred yards away. At that moment, an explosion occurred in the center stern rake compartment. This was an explosion of great force and was followed in a few seconds by a secondary explosion of reduced intensity.

11. The five deceased men all apparently were killed immediately. Hebert who was standing over the compartment manhole was thrown off the vessel into the nearby water where his body was later recovered. Robert who was working on the outside of the pump room was catapulted approximately 200 feet to a nearby drydock. SAVOIE and KNOBLOCK were insulation workers, working in the pump room housing when the housing was flipped off the barge. SMITH was on the dock and was crushed when the pump room landed on top of him.

12. After the explosion the stern section of the FS-20 continued to burn. This fire was extinguished by fire and rescue parties from CGC DIONE, CGC TRITON and CGC RAMBLER all of whom were in the shipyard undergoing repairs.

13. LCDR Thomas L. Wakefield, USCG, attached to Investigation Section, Marine Inspection office, New Orleans, had been aboard FS-20 earlier in the morning and had left the barge twenty minutes before the explosion. Wakefield had gone aboard for the purpose of investigating the fire casualty which had occurred one week earlier. Wakefield was in the yard office approximately 300 yards away when he heard the hissing sound followed by the two explosions.

14. Samples of NO-OX-ID-A Special rust preventative were later analyzed and the analysis report is attached to the record. These analyses showed the following:

Flashpoint of NO-OX-ID-A Special taken from a new unopened can	-	85° F
Flashpoint of rust preventative taken from bulkheads of wing tanks and fwd compartments of FS-20	-	90° F
Flashpoint of rust preventative taken from overhead of compartment in which explosion occurred	-	315° F
Flashpoint of sample of oil used in molten sulphur heating system	-	360° F

15. Regulations governing the requirement of gas free certificates are contained in 46 CFR 35.01-1 as amended by FRR No. 23-59. The only other applicable regulations governing gas free certificates were found to be contained in pamphlet NFPA No. 306, entitled "Regulations Governing the Control of Gas Hazards On Vessels" issued by National Fire Protection Association, 60 Batterymarch Street, Boston 10, Massachusetts. These regulations have been adopted by the American Bureau of Shipping, whose gas chemist certifications are recognized by 46 CFR 35.01-1.

16. The designations used in issuance of the gas chemist's certificate are contained in these regulations and are the same as appears on the bottom of the gas chemist certificate attached to this record. The only specific requirement contained in NFPA No. 306 is in Table I, on page 6 of that pamphlet which shows permitted toxicity limits. These regulations also contain a requirement that "the residues in all cargo compartments and other spaces...shall not be capable, in the opinion of the Certificated Gas Chemist of releasing gas which will raise the concentration in any such space above the limits of Table I." The regulations do not contain any specific requirement as to how these residues are to be tested nor do they contain any requirements as to methods used in the testing of vapor contents of a space.

17. On the afternoon following the explosion, Mr. [REDACTED], who issued the original gas chemist certificate, made additional tests of the spaces of the barge which were not affected by the explosion. Mr. [REDACTED] testified that he again found no explosive vapors whatsoever in any of the spaces. The following afternoon, Mr. [REDACTED], also a certified gas chemist, made tests on these same compartments and found that the compartments on the sunny side of the barge contained explosive vapors in the range of 5 to 9 percent and that the compartments on the shady side of the barge contained vapors in approximately a two percent concentration.

18. Death certificates issued for each of the deceased persons have been requested and to date all have been received and are attached hereto.



Conclusions:

1. It is concluded that this casualty was caused by:
  - a. The burning of NO-OX-ID-A Special rust preventative on the bulkheads of the center stern rake compartment. This substance was ignited from the heat and the flame of the cutting torch used by Price.
  - b. This fire spread rapidly and the heat of the fire liberated volatile gases from the NO-OX-ID-A Special.
  - c. This rate of liberation was such that the pressure built up rapidly in the stern rake compartment even though the manhole was open. In addition the gases created an explosive concentration and an explosion of great magnitude followed.
2. That the secondary explosion was the result of the explosion of similar gases formed in the port stern rake compartment as a result of heat of the fire and explosion in the center compartment.
3. That the deaths of all five men, listed in paragraph 4 of facts, were caused by injuries suffered as a result of this casualty.
4. That the use of NO-OX-ID-A Special rust preventative presents a hazardous condition when used in enclosed compartments on vessels. It is concluded that this substance releases volatile gases when exposed to heat. In view of the relatively low flashpoint, i.e. 85° F, it is concluded that these gases can be easily ignited, especially if any hot work is performed in or adjacent to compartments which have been coated with this substance.
5. NO-OX-ID-A Special is produced by Dearborn Chemical Co., Chicago, Illinois. The company also produces NO-OX-ID-A which contains no solvents and has a flashpoint of approximately 525°. It is believed that only that material with the "Special" designation would present the hazardous condition as concluded above. However, the similarity of the trade names could very easily lead to some confusion and anyone using either of these materials would have to exercise some caution due to the dangerous differences in properties of the two materials.
6. That the tests made by Mr. [REDACTED] were insufficient upon which to properly base a certification that "...the residues are not capable of producing dangerous gases ....in the presence of fire." It is concluded that the materials in the compartment, at the time such certification was issued, did produce dangerous gases in the presence of fire. In instances where a compartment contains materials of unknown chemical properties, it is believed that a test, such as an open-cup test, should be performed before the compartment can be certified to be "Safe for Fire."

7. That, in view of the above, existing regulations governing the issuance of gas chemist certificates are lacking in that there are no specific requirements as to what tests or methods should be employed as a basis for certifying vessels or compartments as to the various safety designations.
8. That no violation of law was noted in this casualty.
9. That no negligence on the part of any persons licensed or documented by the Coast Guard or of any federal employee was involved in this casualty.
10. That no failure of inspected material was involved in this casualty.
11. The addition of the thinner, known as varsol, to the NO-OX-ID-A Special by Todd Shipyard personnel is not held to be contributory to this casualty in view of the fact that the material found in FS-20 compartments, to which varsol had been added, did in fact have a slightly higher flashpoint than the flashpoint of a fresh can of NO-OX-ID-A Special.

Recommendations:

1. It is recommended that Headquarters give consideration to reviewing existing regulations contained in the Code of Federal Regulations and those adopted by the American Bureau of Shipping relating to gas hazards on vessels, as to the adequacy of such regulations.
2. It is recommended that suitable publication be given to the hazard created in the use of NO-OX-ID-A Special, or substances with similar low flashpoints, on enclosed compartments in vessels.
3. No other actions are indicated and it is recommended that, except for the actions recommended in paragraphs 1 and 2 above, this case be closed with no further action.

[REDACTED]  
[REDACTED]  
JOHN F. KETTLER  
Captain, USCG  
Chairman  
[REDACTED]

GEORGE J. LODIE  
Commander, USCG  
Member  
[REDACTED]

Lieutenant, USCG  
Member and Recorder