Identification No. 04-00743
Report Issued October 15, 1975

INTRODUCTION

This report is based on an investigation made pursuant to clause (1) of Section 4 of the Federal Metal and Nonmetallic Mine Safety Act (80 Stat. 772).

About 3:30 p.m., June 25, 1975, W. E. (Willie) Dodderer, millwright, SSN 555- , age 27, was asphyxiated when he and Eric R. Willis, millwright, entered a caisson in an attempt to rescue Brent Black, millwright, SSN 519- , age 35, who had succumbed earlier in an oxygen deficient atmosphere. The caisson was an upright corrugated steel tube about 6½ feet in diameter and 26 feet long, with approximately 10 feet protruding above ground. The caisson provided access to an underflow line and shutoff valve from a three-million-gallon thickener tank. The underflow line, near the bottom of the caisson, was being frozen with liquid nitrogen so that a faulty gate valve could be changed. Nitrogen leaking from the freeze jacket resulted in an oxygen deficient atmosphere.

Black is survived by his wife and five dependents; Dodderer by his wife and two dependents.

The Alameda office of the Mining Enforcement and Safety Administration was notified of the accident by telephone about 11 a.m., June 26, 1975. An investigation was started that afternoon.

Information for this report was obtained by visiting the scene of the accident, from discussions with company officials, employees, union representatives, and from statements taken by the Kern County Sheriff's Department, and the Bureau of Investigations, California Division of Industrial Safety.

GENERAL INFORMATION

The Boron open-pit borax mine and mill, operated by the United States Borax and Chemical Corporation, T. M. Cromwell, General Manager, is 3 miles north of Boron, Kern County, California. Working three 8-hour shifts a day, 7 days a week, were 945 employees.

Participating in the investigation or postinvestigation conference were:

Boron Mine and Mill

T. M. Cromwell, General Manager
Richard Jensen, Assistant General Manager
Lowell B. Page, Maintenance Superintendent
Alfred Jewett, Primary Processing Plant Superintendent
Henry Mabe, Primary Processing Plant Maintenance Supervisor
Dale Woodward, Safety Supervisor

California Division of Industrial Safety

Henry C. McIntire, Safety Engineer, Mining and Tunneling
Jerry L. Hildreth, Senior Special Investigator, Bureau of Investigations

Mining Enforcement and Safety Administration

Garry J. Day, Supervisory Metal and Nonmetal Mine Inspector
Jerald A. Drussel, Metal and Nonmetal Mine Inspector

The last regular inspection of this property under P.L. 89-577, was conducted June 3-5, 1975.

DESCRIPTION OF ACCIDENT

On the day before the accident, Eric R. Willis, millwright second class, and Gary Passmore, were assigned to repair leaks in the freeze system at No. 4 caisson, Plant 1. They worked at the assigned task for half the day; then Brent Black, millwright first class, replaced Passmore. They finished that shift and on the following day worked on the repairs until 2 p.m., The nitrogen pipelines were repaired, a welded plug was removed from the freeze jacket, a hole about 4 inches square was cut in the jacket, so mud could be washed out, and the cut out piece welded back in place.

Compressed air was then blown through the freeze system to make sure all the water was out. Merlin Hamilton, maintenance foreman, was present when the freeze system was blown out with compressed air. After telling Black and Willis to connect the nitrogen to the line and start the freezing process and assigning Willie Dodderer and Elmer Price to assist Black and Willis, he went to his office.

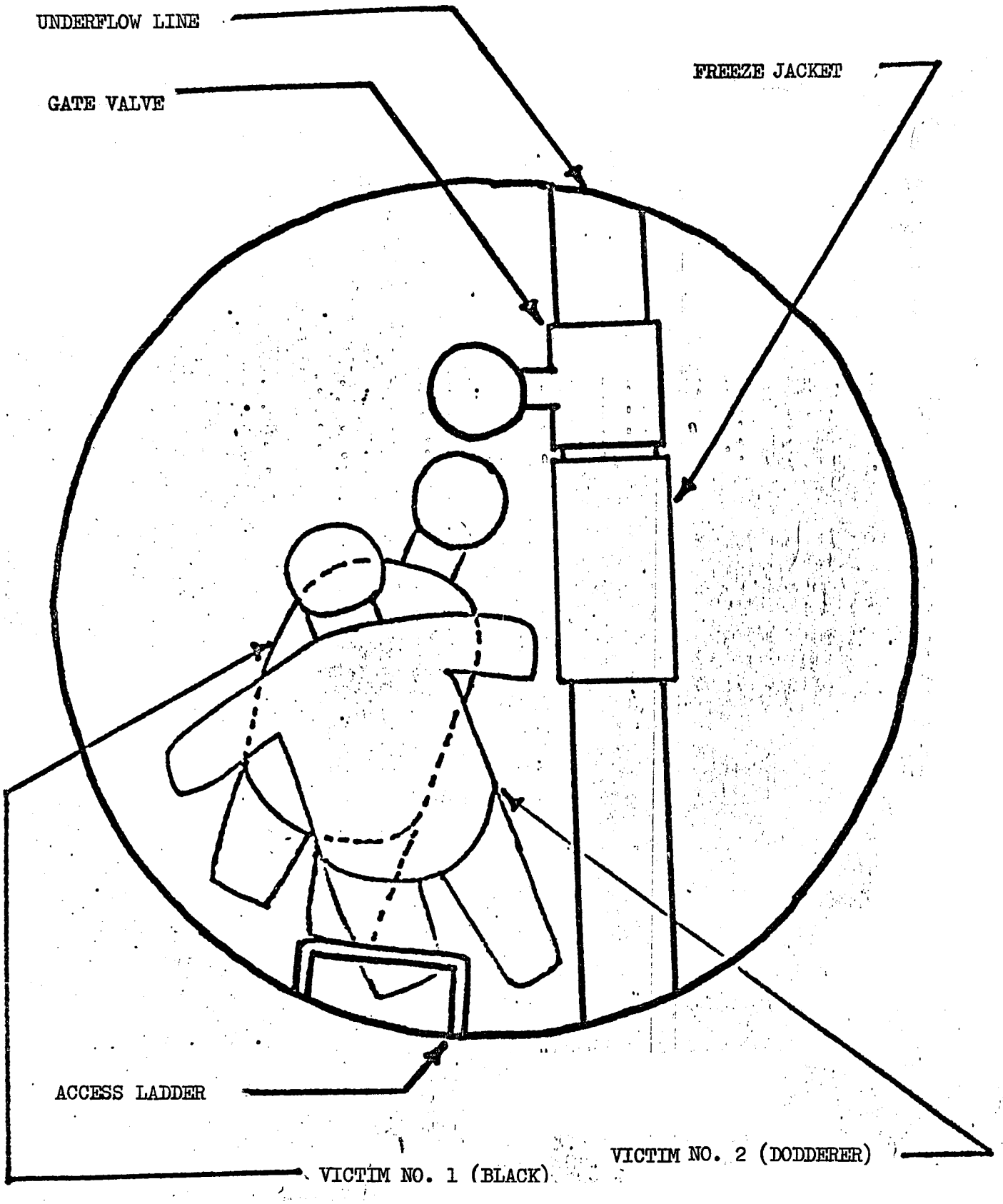
A rubber hose from a trailer containing liquid nitrogen was connected to the inlet line and the valve opened. The flow was adjusted so a vapor was emitted from the exhaust line.

A positive method to tell when the underflow line was frozen was not provided, however, it was known from past experience that when the jacket was completely covered with frost, after approximately 4 hours of freezing, the nitrogen could be turned off and repairs completed.

The caisson was not ventilated and no instruments were available to monitor the air. The freeze system had not been pressure-checked for leakage prior to being connected to the nitrogen source.

Dodderer and Price arrived at the caisson about 3 p.m., and at about the same time, Black left the area of the caisson. When he did not return in a few minutes, Willis, Dodderer, and Price went to the main shop and their own shop for tools before returning to the No. 4 caisson. Black was not in sight and after looking for him at the nearby control room, they decided to continue without him. Dodderer climbed the ladder to the platform near the top of the caisson. He looked down into the caisson and thought he saw someone in the bottom. He immediately started down the ladder into the caisson, followed by Willis. They yelled to Price outside the caisson to shut off the nitrogen and go for help because Black was down there. On arriving at the bottom, Dodderer tried to lift Black and found his body frozen to the ground. Willis then remembered that his foreman had told him that nitrogen "froze the oxygen" or something like that. Price heard Willis yell at Dodderer "Get out of here; you won't be able to breathe". About half way up the ladder, Willis looked down and thought he saw Dodderer start

THICKENER TANK NO. 4 ACCESS CAISSON



for the ladder. He climbed out and went with Price, who had turned off the nitrogen valves and was leaving in the pickup. They went to the main shop, reported the accident and went for the nurse.

When they returned to the caisson, less than 5 minutes had elapsed. Joe Lanyon, granulating plant maintenance foreman, and Wilbert Kennedy, general plant maintenance foreman, were on the platform at the top of the caisson. After calling for ropes and resuscitators, they cut the oxygen hose at the welding torch and adjusted the oxygen flow. Lanyon placed the end of the oxygen hose between his teeth and with a rope tied around his chest, descended into the caisson. About half way down, the hose came out of his mouth and he let it fall to the bottom. He climbed back up the ladder because of a sensation that he was not getting any oxygen. The oxygen hose was pulled up and Lanyon was given pure oxygen until he was breathing normally. He then dropped the oxygen hose back to the bottom where it discharged oxygen into the atmosphere for approximately 3 to 5 minutes. Lanyon then descended to the bottom to tie a rope on Dodderer and called for help, and Kennedy (without a lifeline) climbed down to help him. They tied the rope around Dodderer and tried to pull him out by hand, but the rope slipped when he was raised just off the bottom. After securing safety harnesses from nearby workmen, the two victims were hoisted to fresh air by a mobile crane, which had by then been positioned above the caisson.

Resuscitation attempts were unsuccessful. Both victims were transported to the hospital in Boron, California where they were pronounced dead.

Air samples taken from within the caisson during the course of the investigation and analyzed in the Mining Enforcement and Safety Administration laboratory, Denver, Colorado, indicated that the air was of satisfactory quality at the time of sampling. Results of the analyses are listed in table 1, appended.

CAUSE OF ACCIDENT

The direct cause of the accident was the failure of the company to provide and enforce a safe method for pretesting the freeze jacket and nitrogen piping. The apparently total lack of awareness of the hazards of using an inert gas such as nitrogen in a confined atmosphere indicated a failure of the company to provide adequate training for the workmen and supervisors involved.

Order Issued

Order No. 1, Imminent Danger, issued at 2 p.m., June 27, 1975. The following condition existed at No. 4 thickener: The weld on the outside of casing was split. There was no means to test the atmosphere. There was no safe procedure to repair or change the pipe. This order was abated July 22, 1975.

Recommendations

A safe work procedure should be developed for maintenance and repair of the underflow lines. The procedure should be put in written form and made available to employees and supervisors who are assigned the work. The procedure should include:

Adequate ventilation.

Testing and monitoring the atmosphere, when hazardous materials are used or when cutting or welding in the caisson.

Supervision at the site until the work is completed.

A plan for evacuation in case of an emergency.

A pressure check of the freeze system before the freezing agent is applied.

The material used for the freeze system should be compatible with the lowest possible temperature of the freezing agent. This would preclude the possibility of damage to the system because of extreme temperature.

Instruction and training in the safe operation of the freeze system should be provided for all workmen and supervisors involved in its use.

/s/ Jerald A. Drussel

Jerald A. Drussel
Metal and Nonmetal Mine Inspector

/s/ Garry J. Day

Garry J. Day
Supervisory Mine Inspector

APPROVED:

E. Levi Brake

E. Levi Brake
Subdistrict Manager

TABLE 1 - ANALYSES OF AIR SAMPLES COLLECTED 6-27-75

MINE/MILL Baron M&M COMPANY U.S. Borax & Chem. Corp. STATE California

COLLECTED BY Garry Day SUBDISTRICT OFFICE Phoenix DATE REC'D 6-30-75

BOTTLE NUMBER	LAB NUMBER	LOCATION IN MINE	DATE AND TIME	CARBON DIOXIDE	OXYGEN	METHANE	CARBON MONOXIDE	
0-8851	G5-1288	No. 4 Thickner	6-27-75 11:30am	.03	20.90	.00	.0000	
0-8849	G5-1289	Thickner No. 4	6-27-75 11:40am	.22	20.69	.00	.0000	

DATE 7-2-75 SIGNED Fred C. Ryan

Denver Technical Support Center