

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

District A

FINAL REPORT OF MAJOR MINE SUFFOCATION DISASTER
DORA NO. 2 MINE
DOVERSPIKE BROTHERS, INCORPORATED
DORA, JEFFERSON COUNTY, PENNSYLVANIA

June 1, 1966

By

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Federal Coal Mine Inspector

and

William M. Demkowicz
Federal Coal Mine Inspector

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INTRODUCTION

This report is based on an investigation made in accordance with provisions of the Federal Coal Mine Safety Act (66 Stat. 692; 30 U.S.C. Secs. 451-483, as amended).

Five men of a seven-man crew were suffocated by oxygen-deficient air in the Dora No. 2 mine shortly before 9:30 p.m., Wednesday, June 1, 1966, when a room the crew was advancing with an auger-type continuous miner unexpectedly cut through into an abandoned section of the same mine. Two men escaped from the room, and a third man apparently also escaped but returned to aid a fellow workman and died. Nineteen men were in the mine at the time the disaster occurred. Seven men in the immediate return air from the room were notified of the occurrence promptly and were not affected. Five men farther inby on the same air current were not notified, completed their shift about 11:30 p.m., and traveled to the affected area before learning of the occurrence.

The names of the victims, their ages, marital status, and number of dependents are listed in Appendix A of this report. Recovery and transportation of the bodies to the surface was completed at 4:10 a.m., June 2, 1966.

GENERAL INFORMATION

The Dora No. 2 mine is along Legislative Route 33005, about 1-1/2 miles south of Dora, Jefferson County, Pennsylvania. The mine is served by autotrucks, which hauled the coal to a cleaning plant operated by the same company, located at Dora and served by the Pittsburgh and Shawmut Railroad.

The names and addresses of the operating officials are:

Carl D. Doverspike	President	Dora, Pennsylvania
James R. Doverspike	Vice President	Ringgold, Pennsylvania
Harry Philp	Superintendent and Mine Foreman	Reynoldsville, Pennsylvania

The mine is opened by three main drifts and an offset fan drift in the Lower Kittanning coalbed, which averages 30 inches in thickness in this locality. Employment was provided for 60 men, of which number 47 worked underground on 2 shifts a day, 5 days a week. The average daily production was 1,000 tons of coal, all mined with three Wilcox continuous miners equipped with advance and bridge conveyors.

The last Federal inspection of the mine was completed April 1, 1966.

MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods

A room-and-pillar system of mining was followed. Room pillars have been recovered since advance conveyors had been added to the continuous miners. Entries, 16 to 28 feet wide, were driven in sets of three, five, or eight on 60-foot centers, and rooms were driven 20 to 40 feet wide on 60-foot centers. Crosscuts were driven on 60-, 75-, and 150-foot centers. The mine map showed that in some instances crosscuts between entries were 120 to 170 feet apart. Usually, two entries or rooms were advanced together.

The 1 right section, which was cut into, consisted of three entries driven to a depth of about 2,550 feet from the main entries to a bad top area and a previously unlocated abandoned gas well directly in front of the belt entry and stopped. Rooms were driven to the left in the section as the entries were advanced, and, according to the mine map, were stopped at a depth of 700 feet from the belt entry, leaving a block of coal about 800 feet wide between 1 right and the inby 2 right entries. According to the mine map, 37 full-length rooms and 2 rooms about 375 feet deep had been driven to the left, then several short rooms were turned off the last or next to last 375-foot room and driven parallel with the left entry to the bad top area. Rooms were turned and driven to varying depths toward the outcrop on the right side of the section on retreat. Pillars were not extracted in the section.

Because of bad roof and falls in the main supply entry between 1 right and 2 right, falls and heaving conditions in the 2 right entries, and high fan water-gage pressure (2.4 inches), it was decided to drive eight new entries, designated as the No. 1 main extension, in the 800-foot

block of coal between 1 right and 2 right for additional airways and a new main belt entry, leaving a 200-foot barrier between these entries and rooms off 1 right. Three of these entries (Nos. 1, 2, and 3) had been driven and connected to a set of five entries, designated as the No. 2 main extension, which had been turned and driven right and left at the inby end of 2 right. The remaining five entries of the set were being advanced from the main entry side. After the first three entries of the set had been connected, two rooms were started off the No. 1 (outby) entry near the No. 2 main extension and were being driven toward 1 right inby the last full-length rooms in that section posted on the mine map.

The mine map indicated that main development in the mine had been stopped in all directions because of adverse mining conditions, except in the No. 2 main extension inby 2 right and a set of three entries just turned off this extension. At the time of the disaster, the No. 2 main extension entries inby 2 right had been driven to a bad top area, and it was doubtful that these entries would be advanced farther. Large areas within the limits of the mining had been developed with rooms and entries and abandoned or pillared, and the terminal ends of some rooms and entries were not connected.

Ventilation and Mine Gases

The mine is classed nongassy. Ventilation was induced by an axial-flow fan installed at the offset drift and operated exhausting. The air was conducted through the mine in a continuous circuit with concrete-block stoppings, air-lock doors, and brattice cloth or brattice-cloth and plastic checks. Most of the crosscuts between the intake and return air courses in the No. 2 main extension entries inby 2 right were closed with plastic material. Line brattices were used to conduct the air to the working faces. The 1 right section, turned off the main intake airway, was open and was not ventilated. Other abandoned and pillared areas in the mine also were not ventilated, but these were along the return airways.

Air quantities, see Appendix B for measuring points, measured and recorded in the mine foreman's record book on June 1, 1966, prior to the disaster are as follows:

Main inlet	- 28,400 cubic feet a minute
Main outlet	- 30,750 cubic feet a minute
No. 1 main extension	
Inlet	- 26,500 cubic feet a minute
Outlet	- 19,500 cubic feet a minute
Last crosscut	- 12,000 cubic feet a minute

2 right	
Inlet	- 8,470 cubic feet a minute
Outlet	- 15,250 cubic feet a minute
Last crosscut	- 6,000 cubic feet a minute

The mine record books showed that preshift, on-shift, and weekly examinations of the mine were made. The mine foreman had attempted to examine the abandoned 1 right section about a month prior to the disaster and had traveled the entries to a depth of about 900 feet, when falls and heaving conditions made further travel difficult and practically impossible, and he felt he may have encountered oxygen-deficient atmosphere because of weakness, but such atmosphere was not indicated on his flame safety lamp. Several gas wells penetrated the coalbed on the property; those in mined areas were protected by barriers of coal.

Dust

The mine surfaces ranged from wet to dry, were free of dangerous accumulations of loose coal and coal dust, and were rock-dusted adequately at the close of the last Federal inspection. However, at the time of the disaster, the No. 1 room off the No. 1 main extension had been driven to a depth of 174 feet and the adjoining No. 2 room had been driven to a depth of 92 feet and were not rock-dusted, and parts of the Nos. 1, 2, and 3 entries of the extension also had not been rock-dusted.

Transportation

Coal was transported from the continuous miners by bridge and advance conveyors, which discharged onto series of belt conveyors that transported the coal to a stockpile area on the surface. Men were transported into and out of the mine on flat steel plates (skids) pulled by battery-powered tractors. Supplies were hauled on skids or rubber-tired cars to the room or entry conveyor discharge points, from which points they were hauled on three-wheeled, tricycle-type, battery-powered vehicles to the faces, which were also used for transportation by the foreman.

Electricity

Electric power, at 250 volts direct current, was used to operate the conveyors and electric face equipment. The electric face equipment, except for some of the battery-powered equipment, was of permissible type. The continuous miner in the rooms being driven off the No. 1 main extension was not maintained in permissible condition as numerous bolts were missing from the cover of the contactor box on the machine. Power wires were installed in a suitable manner, and the power circuits were provided with lightning and overload protection. The electric

equipment was frame-grounded effectively at the close of the last Federal inspection. Trailing cables were fire resistant and protected against short circuits.

Mine Map

A mine map, reportedly last brought up to date in March 1966, was posted in the mine office. The map indicated that rooms turned to the left off 1 right had been driven to a depth of about 700 feet from the belt entry; however, the rooms were not surveyed or measured when completed, and their stopping distances were determined from the number of chain conveyor pans reported used in a room by the foremen, plus the length of the continuous miner and its bridge conveyor. According to officials, full-length rooms in the section were driven the length of 110 conveyor pans, each 6 feet 2 inches long, plus the 56-foot length of the continuous miner and its bridge; thus, the rooms were actually driven to a depth of about 730 feet from the belt entry. The map only showed 37 full-length rooms to the left off 1 right and 39 had been driven. A resurvey made of the No. 1 main extension and 2 right after the disaster revealed that the No. 2 main extension entries had been plotted on the map about 60 feet farther inby than they had been turned off 2 right, and a power borehole, which was to have drilled through into the mine in a crosscut to the left of the No. 2 entry of the No. 2 extension inby 2 right, actually drilled through into the No. 1 entry. Two areas that had been mined and abandoned prior to February and March 1966 were not shown on the map.

Illumination and Smoking

Permissible electric cap lamps were used for portable illumination underground, and smoking was prohibited and was not observed in the mine during Federal inspections.

Mine Rescue

A mine rescue team was not maintained at the mine, and such teams were not available in the area. A State mine rescue truck was stationed about 65 miles from the mine. This truck arrived at the mine at about 1:15 a.m., June 2, 1966, but rescue equipment on the truck was not used. Self-rescuers were stored in suitable containers at conveyor heads near the working areas underground.

STORY OF DISASTER AND RECOVERY OPERATIONS

Participating Organizations

Officials of Doverspike Brothers, Incorporated, and representatives of the Pennsylvania Department of Mines and Mineral Industries and the United States Bureau of Mines participated in the recovery operations.

Activities of Bureau of Mines Personnel

Warren K. Lewis, Federal coal mine inspector, stationed at Punxsutawney, Pennsylvania, was notified of the occurrence by telephone by J. E. Lamont, State mine inspector, about 10:45 p.m., June 1, 1966, and immediately proceeded to the mine arriving about 11:10 p.m. On ascertaining the nature and location of the disaster, Lewis called Frank A. Koza, Federal coal mine inspector, also stationed at Punxsutawney, about 11:15 p.m., who in turn notified C. J. Dalzell, of the Johnstown, Pennsylvania, Subdistrict Office of the Bureau. Federal Inspector William M. Demkowicz, stationed at Johnstown, was notified of the occurrence at 11:55 p.m. by Dalzell and arrived at the mine at about 2 a.m., June 2, 1966. After learning that Warren K. Lewis and J. E. Lamont had entered the mine at 11:40 p.m. and had not been heard from up to the time of his arrival, Demkowicz entered the mine at 2:10 a.m. to ascertain the delay in relaying messages to the surface, and, upon locating Lamont and Lewis, assisted in the recovery of the last two bodies. On his return to the surface at 4 a.m., Demkowicz notified Dalzell at Johnstown and H. F. Weaver and James Westfield of the Washington Office of the Bureau of the nature of the disaster.

James Westfield, Assistant Director--Health and Safety, and W. Dan Walker, Jr., District Manager, Health and Safety District A, arrived at Punxsutawney on the evening of June 2, 1966, and participated in the investigation of the disaster the following day.

A withdrawal Order citing imminent danger of a suffocation accident was issued to the operator under section 203(a)(1) of the Act on June 2, 1966, by Federal Inspector Warren K. Lewis, following his return to the surface, requiring that all men, except those referred to in section 203 (a)(2) of the Act, be withdrawn from and debarred from entering the mine. Before the Order was issued, management had withdrawn all men from the mine, except those needed to recover the bodies of the victims.

Evidence of Activities and Story of Disaster

The mine was being operated normally, and no unusual conditions had been reported up to the time of the accident.

The rooms turned off the No. 1 main extension toward 1 right were started about 11:30 a.m., May 31, 1966. The first crosscut between the rooms and cutbacks outward and inward in the No. 2 room were completed on the day shift on June 1, 1966, and the continuous miner was moved to and sumped on the right side of the face of No. 1 room at the end of the shift. The foreman of the crew had been instructed verbally by the mine foreman before entering the mine on the shift to start drilling test holes in the No. 1 room when it reached a depth of 150 feet from the rib of No. 1 entry of No. 1 main extension. A hand-held electric drill and a 20-foot auger were taken into the mine for this purpose at the beginning of the shift. Test holes were not drilled in the No. 1 room on the day shift as the room had not reached the specified depth.

The regular foreman on the second-shift crew in the rooms reported off on June 1, 1966, and the operator of the continuous miner on the shift, who was not a certified foreman, was assigned to act as foreman by the mine foreman, in addition to operating the machine. The operator was given a flame safety lamp on the surface by the mine foreman for use during the shift and was instructed to advance the No. 1 room a sufficient distance to turn the second crosscut and not to advance the room farther than enough to turn the crosscut. Crosscuts were turned on 75-foot centers and could be turned when a place was advanced about 89 feet beyond the centerline of the last crosscut. The operator was also instructed verbally in the presence of or within hearing of other persons to start drilling test holes in the room when it reached a depth of 175 feet. The instructions on drilling test holes, reportedly, included a diagram of the pattern for drilling, one hole at a 45° angle in each rib and one in the face, but they did not include procedures or precautions to be followed should test holes drill through into other workings. The mine foreman also assigned a man from another crew on the shift to work in the room and to drill test holes if necessary.

The second-shift crew resumed mining operations in the No. 1 room where the day-shift crew left off, and advanced the room about 20 feet on the belt structure which remained on the room conveyor from the previous shift. The crew then added frame sections, each 6 feet long, and belting to the conveyor twice during the shift, three frame lengths the first time and six the second, and continued to advance the room. The starting point of the crosscut to be turned had been marked by the left jack setter, and the last cut was being made in the face preparatory to moving back to start the crosscut when the left auger of the miner cut into the left side at the face of a room driven off 1 right. Test holes had not been drilled in either the face or ribs during the shift.

At the time the active room cut into the abandoned room, the left jack setter was along the left side of the miner near the face, and one man was along the bridge conveyor about 40 feet outby the face removing posts in the area the crosscut was to be started. The right jack setter was near the face at the right side of the room, the miner operator was at the controls at the right rear side of the machine, and a timberman was near the operator and at the end of the line brattice about 20 feet from the face. Two men, the bridge-conveyor operator (bridgeman) and a supply man, were sitting against the line brattice opposite the end of the bridge conveyor waiting to move the advance and bridge conveyors back when the miner was to be moved back to start the crosscut.

The first indication of an unusual occurrence or condition was when the right jack setter, who was almost directly across from the hole cut into the abandoned room, started away from the face, and either faltered or fell. The operator then apparently realizing that the room

had cut into the abandoned area and black damp was flooding the room, shouted "Come on everybody, let's get out of here," shut off the miner, and started out of the place. How far he got out of the place could not be definitely ascertained, but he traveled some distance away from the miner, then crossed the conveyor or conveyors and crawled inward on the left side to help the workman who had been removing posts. The left jack setter started from his position and crossed the bridge conveyor at the miner, got faint, and fell after crossing the conveyor, then rose and crossed to the intake side of the line brattice and crawled out of the room to fresh air in the No. 1 entry. After reaching the No. 1 entry, this man turned, started to reenter the room, at which time he looked at his watch and noted the time was 9:30 p.m., but again felt faint and retreated to the entry.

When the continuous miner was shut off, the bridgeman crawled to the outby end of the advance conveyor and shut it off and on hearing the miner operator shout, crawled to the intake side of the line brattice and out of the room. Thinking that a trailing cable may have blown out, the bridgeman crawled to the No. 2 entry of the extension and disconnected power from the equipment in the room. The two men who escaped from the room then rode the main belt outby to the area in which additional entries of the No. 1 extension were being advanced, and notified the crew advancing these entries of the occurrence.

One man of the crew working outby the disaster area was sent to the surface to notify officials, and the remaining members of the crew, including the foreman who had a flame safety lamp, and the two men who escaped returned to the affected room. On their arrival at the room, oxygen-deficient atmosphere had reached the No. 1 entry from the abandoned area, and a flame safety lamp would not burn in the entrance to the room. Lights could be seen in the room, and several of the men insisted on attempting to enter the room; however, these men were convinced of the danger involved when one of the men collapsed on crawling a short distance inby the foreman, whose flame safety lamp had gone out, and was brought back to fresh air. All of the men then left the area and were on the main entry at No. 1 entry of the extension when the mine foreman arrived from the surface.

Recovery Operations

Harry Philp, mine foreman, was notified by telephone, about 9:40 p.m., by James Gelnette, a member of the crew advancing entries of the No. 1 main extension, that the No. 1 room of the extension had cut into old works, that black damp had entered the room, and that five men were still in the room. Philp immediately proceeded to the mine, and realizing that the air had short-circuited through the abandoned 1 right section, began to assemble material to close the 1 right entries at the main intake entry. James R. Doverspike, one of the owners of the mine, was also notified of the occurrence by Gelnette, and notified J. E. Lamont, State mine inspector, about 10:30 p.m. Doverspike arrived at the mine

shortly after the mine foreman's arrival, and with the help of Gelnette began to close the 1 right openings. Philp proceeded into the mine, met the men who had left the affected area on the main entry at the No. 1 main extension, sent all but two of these men to assist in closing the 1 right openings, and then continued on to the affected area with the remaining two men.

On his arrival at the No. 1 room, Philp encountered oxygen-deficient air at the mouth of the room and on the return side of the line brattice inby, and also noted that the line brattice was open where it crossed the supply road side of the conveyor in the room. This part of the brattice apparently had been left open during the shift for passage of the supply tractor, which was in the room at the time of the disaster. Philp realized that men working in the No. 2 main extension entries inby 2 right, who had not been notified of the occurrence, would be traveling toward the return side of the room at the end of their shift, and that he did not have time to attempt to travel through the main and 2 right entries to notify the men not to travel their regular route out of the mine. Philp with the aid of the two men with him then took down the line brattice across the entry into the room, closed the mouth of the No. 1 room with a brattice-cloth curtain, took down a check curtain placed across the entry between Nos. 1 and 2 rooms on the day shift, and was attempting to reach the No. 2 room to close it off when he saw lights approaching inby the room on No. 1 extension. Philp, using his cap lamp, attempted to flag off four men traveling on a tractor and skid, but they continued on and finally stopped about 150 feet inby the No. 2 room. On attempting to reach the No. 2 room, Philp noted that his flame safety lamp would burn when held close to the roof but would extinguish when held close to the floor. He asked if the flame safety lamp carried by the men was burning and was informed that it was, then instructed the men to hold their heads close to the roof and to come ahead with the tractor on full speed. The tractor operator was sickened in traveling through the area. The foreman of this crew had left his section about 10:30 p.m., left his flame safety lamp with the crew, traveled through 2 right and main entries checking belt conveyors and a pump to the No. 1 main extension where he found lunch pails on the entry and decided something unusual had occurred, then traveled into the extension.

After the arrival of J. E. Lamont, State mine inspector, at the mine about 11:20 p.m. with two 1/2-hour demand self-contained compressed-air breathing apparatus and a spare tank obtained at a fire station, Lamont and Warren K. Lewis, Federal inspector, entered the mine and arrived at the No. 1 room off the No. 1 main extension about 11:55 p.m. At that time, the openings to 1 right had been closed with brattice cloth, most of the men engaged in this task had returned to the affected area, and all but three of the men then in the mine were sent to the surface by the mine foreman. On the arrival of Lamont and Lewis, the line brattice had been reinstalled across the entry into the No. 1 room, and measurements indicated that about 8,100 cubic feet of air a minute was passing through the No. 1 entry toward the room. Air on the intake side of the line brattice in

the room began to clear, and the first body (Hilton Neiswonger, supply man) located on the intake side of the brattice was recovered without the use of respiratory equipment at 12:10 a.m., June 2, 1966. Lamont donned one of the breathing apparatus at 12:52 a.m. and explored the room to determine if any of the remaining victims were alive, locations of the bodies, and conditions in the room. In the meantime, men were sent to obtain an auxiliary blower fan from the left entries of the No. 1 main extension, and this fan was put into operation without tubing on the intake side of the line brattice a short distance in the room at 1:20 a.m. The body of Samuel Gaul, right jack setter, was recovered on the intake side of the brattice, 36 feet from the face at 1:35 a.m.; and the body of Robert White, timberman, with an ax and brattice cloth in the hands, was recovered at the end of the intake side of the brattice 20 feet from the face at 1:45 a.m. Both of these bodies were recovered in fresh air.

The line brattice was then extended from a point where it crossed from the left side of the conveyor to the right side of the room to within about 5 feet from one of the two bodies remaining on the left side of the room; however, the line brattice on the right side had been left up with the end outby that on the left side and a flame safety lamp would not burn at the end of the extended brattice. On the arrival of William M. Demkowicz, Federal inspector, in the area, it was suggested that the blower fan be moved farther into the room to hasten clearing of the oxygen-deficient air, but moving the fan inward caused more contaminated air to be moved outward behind the brattice on the right side. After this brattice was torn down, the air cleared rapidly, and the bodies of John Kramer, 54 feet from the face, and Ronald Moore, 46 feet from the face, were recovered at 3 a.m. The position of the bodies, except that of Kramer, indicated that the men were attempting to escape from the room or had turned to escape. Kramer's body was lying with the head toward that of Moore on the left side of the room and on the opposite side from the controls on the continuous miner. The bodies were brought to the surface at 4:10 a.m., June 2.

After the bodies and all other men were removed from the mine, a brattice-cloth check was installed across the main intake entry inby l right, the stoppings in the openings into l right were removed, and intake air was directed through l right until the investigation of the disaster was started.

INVESTIGATION OF CAUSE OF DISASTER

An investigation of the cause of the disaster was made on June 3, 1966, by the following persons:

Doverspike Brothers, Incorporated

Harry Philp

Mine Foreman

Pennsylvania Department of Mines and Mineral Industries

J. E. Lamont	Inspector, 14th Bituminous District
R. J. Emigh	Inspector, 9th Bituminous District
P. B. Gaddis	Inspector, 17th Bituminous District
M. W. Thomas	Inspector-at-Large

United States Bureau of Mines

James Westfield	Assistant Director--Health and Safety
W. Dan Walker, Jr.	District Manager, District A
Warren K. Lewis	Federal Coal Mine Inspector
William M. Demkowicz	Federal Coal Mine Inspector

Hearings were held on June 6-7, 1966, at the company's office at Dora, Pennsylvania, to obtain information from men who escaped from the section, company officials, and other employees who might have had information regarding events prior to and at the time of the disaster. The hearings were conducted by representatives of the Pennsylvania Department of Mines and Mineral Industries, including T. E. Jones, Deputy Secretary. Bureau of Mines personnel who participated in the hearings included those on the investigating committee and C. J. Dalzell, Acting Subdistrict Manager, Health and Safety District A.

Point of Origin

The investigation disclosed that the No. 1 room off the No. 1 main extension had been advanced about 75 feet during the shift, the face was about 131 feet in by the centerline of the last crosscut, and the room had been driven to a depth of 174 feet from the No. 1 entry. The miner had cut 22 feet, including the sump, from right to left when the left auger cut into the left side of the face of a room driven off 1 right not shown on the mine map. Evidence on the face of the room indicated that the left auger had been lowered, cut through near the bottom, and then was raised, enlarging the hole to 20 inches by 36 inches. When the working room cut through into the abandoned room, the air short-circuited through the abandoned section, reversed the normal airflow in the working room, and flooded the room with oxygen-deficient air. Oxygen determinations made on June 2 in return air at the fan by men in charge of the State mine rescue truck indicated 17.5 percent oxygen and a trace of carbon dioxide in the air at 1:20 a.m., 19.0 percent oxygen at 2:45 a.m., and 20.0 percent oxygen at 3:50 a.m. After the continuous miner was pulled back from the face during the investigation and with the openings to 1 right closed with brattice cloth at the main entry, about 6,100 cubic feet of air a minute was flowing from the abandoned section into the active room. An air sample, see table 1, collected at the opening at that time contained 0.13 percent carbon dioxide and 20.50 percent oxygen.

At the time the two rooms off the No. 1 main extension were planned, it was calculated that they could be driven about 675 feet to the bad top area at the end of 1 right leaving a 76- to 78-foot barrier between the No. 1 room and the inby side of the worked-out area of 1 right shown on the mine map. A block of coal between the end of 1 right and a bad top area encountered at the end of the No. 2 main extension was to be recovered from the rooms, and the possibility of using 1 right as an intake airway had been considered. The mine map showed that 37 full-length rooms had been driven to the left off 1 right; however, two rooms (Nos. 38 and 39), shown as having been driven to a depth of about 375 feet, had been driven farther than the area shown as being worked out by full-length rooms. The fire-boss book at the mine for the period during which the last full-length rooms were driven off 1 right contained entries on the Nos. 38 and 39 rooms over a period of 6 days, at the beginning of which the No. 38 room, no doubt, had been completed and was being used as a supply way. According to officials, a full-length room (110 conveyor-pan lengths) was completed in 4 or 5 days (8 or 10 shifts). Testimony indicated that it was not unusual to continue advancing a room to complete a shift when the room had reached its projected stopping distance before the end of the shift.

Drilling equipment had been taken into the mine and left at the neck of the room, and test holes were to be drilled in the rooms for protection against the possible accumulations of water. Elevations had not been determined in any part of the mine. Instructions had been given to the day-shift foreman to start drilling test holes at a depth of 150 feet, and similar instructions, which reportedly included a drilling pattern, were given to the substitute foreman on the second shift to start drilling holes at a depth of 175 feet. No instructions were given on procedures to be followed should a test hole drill through and water was not encountered. The greatest concern in drilling test holes was for protection against water. Testimony indicated that the room may have been cut through had a test hole drilled through and not encountered water. Procedures to be followed had water not been encountered were left to the discretion of the face foreman. The seven foremen at the mine, two of whom were not certified, were provided with flame safety lamps, which they serviced themselves, and preshift and on-shift examinations were recorded; however, testimony indicated that the flame safety lamps were used only at the beginning and ending of a shift and left hanging on posts away from the faces during the remainder of the shift. The substitute foreman, also not a certified foreman, was given a flame safety lamp on the surface at the beginning of the shift, but in the confusion resulting during the recovery operations, it was not established whether the lamp had been taken into the mine. No other foreman visited the room during the shift.

Summary of Evidence

Conditions observed in the mine during recovery operations and the investigation following the disaster, scrutiny of the mine map, information obtained from officials and workmen, and hearings provided evidence as to the cause of the accident. This evidence is summarized as follows:

1. The mine map was inaccurate and did not show all excavations in 1 right.
2. Rooms were not surveyed or measured and their stopping points were posted on the map from the number of conveyor pans reported used in a room by foremen.
3. Test holes were not drilled in the No. 1 room off the No. 1 main extension.
4. The abandoned 1 right section was not ventilated or sealed.
5. The hazard of oxygen-deficient atmosphere or black damp when cutting through into the abandoned, unventilated area, which could not be and was not fully explored, was not fully recognized and prepared for.
6. The substitute foreman was not certified and was not given any instructions on hazards to be expected, procedures to be followed or precautions to be taken if test holes drilled through into other workings.
7. The primary concern in drilling test holes was for protection against water.
8. The mine, operated with three continuous miners, was ventilated by a continuous air current.
9. Intake air short-circuited into the active room off No. 1 extension through the abandoned 1 right section flooding the working room with oxygen-deficient air.
10. The line brattice in the working room was open across the supply road permitting oxygen-deficient air to flow behind the intake side of the brattice.
11. The substitute foreman was given a flame safety lamp on the surface, but it was not established whether the lamp was taken into the mine. Testimony indicated that flame safety lamps were used twice, once at the beginning and once at the end of a shift, and left hanging on posts back from the faces during the remainder of the shift.
12. Prompt notification of men working in return air from the room in entries immediately outby prevented them from being affected.
13. The contaminated atmosphere was diluted sufficiently, apparently by leakage of fresh air, before reaching men working on the extreme inby end of the air current to harm them.

Cause of Disaster

The suffocations occurred when the No. 1 room being advanced with a Wilcox miner cut through into an area of the abandoned 1 right section that was not shown on the mine map, and intake air short-circuited through the abandoned section flooding the working room with oxygen-deficient air. Test holes were not drilled in advance of the room.

RECOMMENDATIONS

The following recommendations are made to prevent similar disasters:

1. All mine workings should be accurately surveyed and plotted precisely on a map, which should be brought up to date at least every 6 months.
2. Whenever any working place in an underground mine approaches within 50 feet of abandoned workings in such mine as shown by surveys made and certified by a competent engineer or surveyor, or within 200 feet of any other abandoned workings of such mine, which cannot be inspected and which may contain dangerous accumulations of water or gas, a borehole or boreholes shall be drilled to a distance of at least 20 feet in advance of such working place. Such boreholes shall be drilled sufficiently close to each other to insure that the advancing face will not accidentally hole through into such workings. Boreholes shall also be drilled not more than 8 feet apart in the rib of such working place to a depth of at least 20 feet and at an angle of 45° . Such rib holes shall be drilled in one or both ribs of such working place as may be necessary for adequate protection of persons working in such place.
3. Whenever necessary to drill test holes in a working place approaching worked-out areas, adequate procedures to be followed and precautions to be taken if a hole drills through into the worked-out area should be adopted and outlined to all foremen and other persons involved.
4. Unsealed abandoned workings should be ventilated and vented directly into the main return.
5. A separate split of air should be provided for each section of a mine operated with continuous miners to avoid contaminated air from being moved from one section to another.
6. When removed for the passage of equipment, line brattices should be replaced promptly.
7. Foremen and other persons whose duties require them to examine working places for dangers should carry flame safety lamps constantly throughout the shift.

The following recommendations have no bearing on the disaster, but should be complied with:

1. The distance between crosscuts in entries and rooms should not exceed 105 feet.
2. Where practicable, a crosscut should be provided at or near the face of an entry or room before the place is abandoned.
3. The auxiliary blower fan in the mine should be removed or permission for its continued use obtained from the Director of the United States Bureau of Mines.
4. On entries, other than room entries, stoppings in crosscuts between intake and return airways should be built of solid, substantial, incombustible material, such as concrete, concrete blocks, brick or tile.
5. Permissible electric equipment should be maintained in permissible condition.
6. All assistant foremen and other persons assigned to act as foremen should possess proper certificates of competency from the State.
7. Mine rescue equipment and men trained in the use of such equipment should be available at the mine, or joint arrangements should be made for such equipment and personnel with other mines of the company or other companies in the area.

ACKNOWLEDGMENT

The cooperation of company officials and employees and representatives of the Pennsylvania Department of Mines and Mineral Industries during the investigation of this disaster is gratefully acknowledged.

Respectfully submitted,

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