United States Department of Labor
Mine Safety and Health Administration
Office of the Administrator
Coal Mine Safety and Health

Report of Investigation
Underground Coal Mine Explosives Accident
No. 3 Mine
I.D. No. 15-16719
Granny Rose Coal Company
Barbourville, Knox County, Kentucky

July 31, 1990

By

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Abstract of Investigation

U.S. Department of Labor
Mine Safety and Health Administration

Authority—This report is based on an investigation made pursuant to the Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164.

Section A—Identification Data

1. Title of investigation: Fatal Explosives Accident
2. Date MSHA investigation started: July 31, 1990
3. Report release date: January 18, 1991
4. Mine: No. 3 Mine
5. Mine ID number: 15-16719
6. Company: Granny Rose Coal Company
7. Town, County, State: Barbourville, Knox County, Kentucky
8. Author(s): Charles E. McGraw and Frank C. Young, Jr.

Section B—Mine Information

9. Daily production: 100 tons
10. Surface employment: 2
11. Underground employment: 9
12. Name of coalbed: Blue Gem
13. Thickness of coalbed: 22"

Section C—Last Quarter Injury Frequency Rate (HSAC) for:

14. Industry: 11.29
15. This operation: 0.00
16. Training program approved: Yes
17. Mine Profile Rating: N/A

Section D—Originating Office

18. Mine Safety and Health Administration Coal Mine Health and Safety District No. : District 7
Address: HC 66, Box 1762, Barbourville, KY 40906

Section E—Abstract

About 2 p.m., July 31, 1990, an explosives accident occurred in the last open crosscut between the Nos. 1 and 2 Right entries of Granny Rose Coal Company's No. 3 Mine. Six miners were present on the working section at the time of the accident. Three of the miners died instantly as a result of the explosion. Two other miners were admitted to the hospital for observation because of smoke inhalation and other trauma. The remaining miner was not injured.

The accident occurred when explosives, located in a scoop bucket attached to a battery-powered tractor, were unintentionally detonated simultaneously with routine production blasting of the 3-way face in the No. 1 right entry (See Map of Accident Scene, Appendix B). The accident and resultant fatalities occurred because mine management failed to take proper measures to ensure entries and crosscuts were mined in the proper direction and alignment, as indicated on the mine plan projections. The No. 1 Right entry and the No. 9 Right crosscut off this entry were mined excessively to the right of center. An unintentional hole through into the last open crosscut between the Nos. 1 and 2 Right entries occurred when the No. 1 entry right face was blasted. The last open crosscut was mined off centerline in an inby direction. This contributed to the accidental hole through.

Section F—Mine Organization

Company officials:	Name	Address
19. President:	Robert Hembree	P. O. Box 1098 Barbourville, Kentucky 40906
20. Superintendent:	N/A	
21. Safety Director:	N/A	
22. Principle officer—H&S:	Robert Hembree	P. O. Box 1098 Barbourville, Kentucky 40906
23. Labor Organization:	None	
24. Chairman—H&S Committee:	N/A	

PART I

General Information

The Granny Rose Coal Company, No. 3 Mine, I.D. No. 15-16719, located near Barbourville, Knox County, Kentucky, is a sole proprietorship operated by Robert Louis Hembree. The mine began producing coal on March 12, 1990. The last complete Mine Safety and Health Administration (MSHA) inspection of the entire mine was conducted from April 2, 1990 through April 11, 1990.

The No. 3 Mine has four drift openings into the Blue Gem Coal Seam, which averages 22 inches in thickness locally. The mine is approximately 1,050 feet above sea level and extends over an area of approximately 10 acres. The mine had 1 working section consisting of 12 advancing entries with connecting crosscuts. The entries are numbered left and right of the fan entry which was designated as 0 entry.

At the time of the accident, the mine employed 11 miners on one production shift, and produced about 100 tons of coal daily. The working faces were located 500 to 600 feet from the surface drift openings.

Mining Method

Coal was blasted off the solid with nitroglycerin-based permissible explosives. Nine to 10 boreholes were drilled in each working face using a hand-held electric drill with a 6-foot auger to create a slab-cut blast pattern. The slab-cut blast pattern caused coal to be displaced along either the right or left rib line. Coal was loaded and transported from the working face to the surface by battery-powered scoop tractors.

The scoop bucket slid on the mine floor and could not be raised or lowered by the tractor operator. Likewise, coal in the scoop bucket could not be discharged by the tractor operator. The only facility to empty a loaded scoop bucket was on the surface where an inclined ramp was used to lower the bucket and discharge the coal.

At the beginning of each shift, all working faces generally contained loose coal which was blasted during the previous shift. The employees' starting times were staggered. The scoop operators entered the mine first and began loading coal. The mining cycle began at the extreme left working place and then advanced sequentially to the right across the working section. The bolting machine operators entered the mine next, after the first place was cleaned up, and began roof bolting on cycle

following behind the scoop operators. The coal drill operators and the shot firer entered the mine last. They drilled, loaded and blasted the faces on cycle following the roof bolting crew.

Explosives/Detonators/Shot Firing Unit

Gel-Coalite Z, a permissible nitroglycerin-based ammonia gelatin dynamite manufactured by Atlas Powder Company, was used to blast the coal faces. It is particularly advantageous in blasting rock or hard coal in underground coal mining because of its high velocity and strength. The explosive cartridge size used was 1-1/4 inches by 8 inches.

Kolmaster II electric detonators, with delay numbers 1 through 9 inclusive, were used to initiate the explosives. The delay periods ranged from 25 to 500 milliseconds. All the detonators were of No. 8 strength and had iron leg wires 8 feet in length with a detonator resistance of 3.3 ohms.

A FEMCO permissible shot-firing unit, approved for initiating a maximum of 20 shots, provided electric current to detonate the explosives.

Transportation and Storage of Explosives

At the beginning of each shift, Ray Carpenter, shot firer, would remove explosives from the powder magazine and load them into the plastic-lined bed of a pickup truck. He would load 10 cases each day and this normally lasted the entire shift. He would also remove electric detonators from the detonator magazine, also located on the surface, and place them into a plastic insulated cooler. The detonators were prepared in bundles, each with 9 to 10 delays designed to blast a working face. There were 18 bundles in the detonator magazine after the accident, which indicated these bundles were made up on a previous shift. Carpenter transported the explosives and detonators to a location near the mine portals, approximately 300 yards from the magazines. The explosives remained in the truck and were unloaded and sent underground, as needed, during the work shift. The detonators were stored near the shop area until Carpenter took the day's supply underground. While working underground, Carpenter would stop a scoop operator to request explosives when needed. On the way to the surface, the scoop operator would load up a yellow fiberglass box which was usually kept three or four crosscuts outby the faces. This fiberglass box was used to haul explosives and was large enough to hold two cases. The scoop operator would stop the scoop near the explosives truck and either he or one of the surface workers would load the explosives into the fiberglass box. The scoop operator would then transport the explosives to Carpenter. At the end of the shift, any unused

explosives and detonators were returned to their respective magazines.

Drilling, Loading and Shooting Procedures

Nine or 10 boreholes were drilled in each face using a nonpermissible hand-held electric drill with 6-foot auger steel. A slab-cut method of blasting was used. For a right slab-cut blast pattern, the first borehole was drilled in the right corner of the face and angled slightly to the right. Adjacent boreholes to the left were drilled approximately parallel to the preceding borehole with the last borehole being drilled straight on the left side of the face. Four explosive cartridges were loaded into each borehole, the first cartridge being the primer. The boreholes were stemmed with approximately one and one-half clay dummies. Detonators, with delay numbers 1 through 9, were connected in series so that the right borehole would detonate first and then each adjacent hole to the left would detonate in delayed sequence. The detonator circuit in the faces was connected to 20-gauge solid copper jumper wires. These jumper wires extended from the blasting area to the first outby crosscut and then connected to a shooting cable. The shooting cable was a 100-foot, 16-gauge, three-conductor extension cord. This cable was connected to a permissible 20-shot firing unit which was used to initiate the blast.

When the face of an entry and the faces of the crosscuts to the left and right were in close proximity, they were connected in series and detonated simultaneously. This is termed a 3-way face.

Mapping

The mine map, available at the mine on the day of the accident, was not up-to-date. It did not include any temporary notations indicating the current location of the working faces. The full extent of mining in the seven entries previously driven to the left of the main entries was not plotted on the map, even though mining in this area had ceased many weeks earlier. During the investigation, it became apparent that a disparity existed between the actual entry orientation and pillar configuration and what was indicated on the mine map.

Electricity

Power was supplied by Rural Electric Co-op at 7200 volts alternating current and reduced by two single-phase 50 kVA transformers to 240/120 volts. One transformer, with separately protected 240/120-volt circuits, provided electrical power to the

surface area for the fan, battery chargers, lights and receptacles. The other transformer provided a 240-volt circuit that entered a visible disconnecting device and then an auto-transformer which increased the voltage before the circuit entered the underground area of the mine.

This single-phase voltage was transmitted approximately 500 feet underground to a fused disconnecting device and another auto-transformer that reduced the voltage. This voltage supplied a rectifier that converted the alternating current voltage to approximately 300 volts of direct current. A fused disconnecting device provided circuit protection for a two-conductor type G, No. 4 trailing cable and a permissible Paul's Repair Shop Roof Bolting Machine, Approval No. 2G-2430.

Coal was hauled from the face area to the surface by four permissible Mescher battery-powered scoop tractors. Coal faces were drilled with a 48-volt direct current nonpermissible drill. The drill was powered by one of the two batteries on a Mescher battery-powered scoop tractor. The scoop tractor used by the drill crew to power and to move the drill from place to place was not manufactured as a permissible machine. According to mine record books, each piece of equipment was examined weekly.

Roof Support

The roof control plan in effect at this mine was approved by the MSHA District Manager on March 8, 1990. Conventional 30-inch mechanical roof bolts were used. A 5-foot by 5-foot bolt pattern, within two feet of the face, was permitted where the roof was firm shale or sandstone exhibiting no defects. When adverse roof conditions were encountered, a 4-foot by 4-foot bolt pattern within two feet of the face was required. The plan permitted mining on 40, 50, or 60-foot centers maintaining crosscut and entry widths at 20 feet or less. The roof at the accident scene was a laminated shale and was drummy.

Ventilation

The mine was developed with four drift openings. Three openings were used for ventilation, two for intake and one for exhaust. Ventilation into the mine was induced by a 5-foot, 10-horsepower shop-built fan. The fan operated in an exhaust mode and was capable of inducing 45,000 cubic feet per minute (CFM) of air at a 0.5 inch water gauge. Permanent stoppings were used to separate the intake and return airways. Intakes were located on both sides of the mine with a central (0 entry) return (see mine map Appendix D). The ventilation plan in effect at the mine was approved by the MSHA District Manager on June 13, 1990. The plan required a minimum of 3,000 CFM of air to be maintained at the

end of the line curtain in each working place where coal was mined or loaded.

Combustible Material/Rock Dusting

Rock dust, applied by hand, was the primary means for inerting coal dust. No rock-dusting machine was provided at the mine. Coal dust, generated when loading coal from the faces with scoops, was controlled by ventilation directed to the working faces by line curtain.

PART II

Description of Accident

The following narrative description of the events before and after the explosion was developed from interviews with survivors of the accident, with other workers at the mine, and those involved in the initial recovery of the victims. Additional information was obtained during the investigation of the accident scene.

On July 31, 1990, at about 7:00 a.m., David Faulkner, section foreman, completed his preshift examination of the 001 working section. After the examination, Dennis Gray, Henry Miles, and Michael Murphy, scoop operators, entered the mine and began loading coal from the first left crosscut off the No. 2 Left entry. Ricky Messer and James Simpson, roof bolting machine operators, entered the mine at about 8:00 a.m. They began roof bolting in the first working place which had been loaded by the scoop operators. Shortly thereafter, Robert Cox and Jack Lake, coal drill operators, and Ray Carpenter, shot firer, entered the mine. They began drilling, loading and blasting operations on cycle after the working places were roof bolted.

The mining cycle continued normally until 11:30 a.m., when the crew exited the mine for lunch. The miners reentered the mine at approximately 12:30 p.m., except for Messer and Murphy who had left the mine site for personal business. Shortly after lunch, Faulkner delivered two cases of explosives to Carpenter who was located in the face area of No. 1 Right entry. This was the first place to be drilled and blasted after lunch.

At approximately 2:00 p.m., an explosion occurred inside the mine. Faulkner, Simpson, Miles, and the three victims (Cox, Lake and Carpenter) were in the working section at this time. Robert Hembree, mine operator, was on the surface, as was Dennis Gray. Gray was discharging coal from his scoop bucket. Hembree was alerted that something was wrong because of the loudness of the

explosion, compared to the sound of a normal blast. Hembree told Gray to go inside the mine and check on the miners. Shortly after Gray entered the mine, Faulkner came to the surface in his scoop. He told Hembree that Miles and Simpson were together and that Simpson was near unconsciousness due to smoke. Faulkner dumped the coal from his scoop bucket and reentered the mine to help Simpson and Miles. On his way in, Faulkner met Gray, who already had Simpson in his scoop bucket. Miles was following in his scoop. They all returned to the surface and began administering oxygen to Simpson.

Hembree then instructed Faulkner, Miles, and Gray to travel back underground and check on the shot firer and the two drillers. Hembree entered the mine a few minutes later and met Faulkner and Miles outby the accident scene. Hembree, observing that Faulkner appeared to be in shock, instructed Gray to take him to the surface. Hembree and Miles then continued on to the accident scene and, unable to find any survivors, they returned to the surface. Cox, Lake, and Carpenter were unaccounted for at this time.

Recovery

The MSHA field office in Barbourville, Kentucky, was notified of the accident at 2:52 p.m., on July 31, 1990, by Bill Swafford, a Barbourville City Policeman. Albert Helton, Coal Mine Inspection Supervisor, received the information. Carl Boone, Subdistrict Manager, immediately dispatched Helton, Ronnie Deaton, Education and Training Specialist; Earl Lankford and Dalmon Parks, Coal Mine Safety and Health Inspectors, to the mine. When they arrived at the mine, they were met by representatives from the Department of Mines, Minerals, and Energy of the State of Kentucky (DMM&E).

At 3:35 p.m., MSHA inspectors Lankford and Parks, DMM&E Inspectors Ronnie Ross and Dale Williams, and Henry Miles, a scoop operator for Granny Rose Coal Company, entered the mine. At 4:24 p.m., Lankford returned to the surface and stated that the recovery team was within one crosscut of the accident site. He also stated that the accident scene was full of smoke and that they needed timbers sent underground to support the roof. At 4:28 p.m., timbers were taken underground and a telephone line was installed. Several persons entered the mine to assist and at 5:00 p.m. telephone communication was established from the surface to the accident scene. Additional timbers were taken underground frequently during the next several hours to correct dangerous roof conditions around the accident area.

At 5:02 p.m., Ralph Helton, Coal Mine Safety and Health Inspector, called the surface to inquire about proper procedures for handling the victims' remains. Jerry Garland, Knox County

Coroner, had arrived at the mine site at approximately 4:30 p.m. He told Boone, who had also arrived at the mine site, that they could proceed to recover the body that was in the battery tractor. At 5:26 p.m., the remains of the victim in the battery tractor were brought to the surface.

At 5:34 p.m., Larry Gilliam, DMM&E, returned to the surface from the accident site. He stated that there were many detonators strewn around the accident area. At 7:58 p.m., Helton called outside and reported that the recovery team had picked up all the detonators. Helton stated they were still setting a few timbers, but everything was under control and inspectors were beginning to check all the working places of the 001 Section.

At 8:08 p.m., Ralph Helton called outside and stated that 75 to 100 more detonators were found intermingled with remains of the victims in the crosscut where the scoop bucket was located. Boone instructed him to leave them in place until Dr. David Wolfe, Kentucky's State Forensic Anthropologist, arrived. At 9:28 p.m., Dr. Wolfe arrived and was briefed on conditions at the accident scene. He then traveled underground and examined the area. Dr. Wolfe determined that the remains of the victims should be brought to the surface for identification and he returned outside at 10:54 p.m. At 11:38 p.m., Dr. Wolfe reentered the mine to check the progress and aid in removal of the victims. He returned outside at 1:26 a.m., Wednesday, August 1. The removal process continued until 6:10 a.m.

At 6:10 a.m., Boone was informed that detonators were found around the battery tractor. At 6:18 a.m., he called for the recovery team to withdraw from the area until the batteries could be disconnected. At 7:28 a.m., Foster Brock, MSHA electrical inspector, arrived at the mine and traveled underground to disconnect the battery cables. At 8:05 a.m., he arrived on the surface and reported that the battery cables had been disconnected.

The remaining detonators were removed from the mine at 12:53 p.m. Recovery continued until 5:10 p.m., when the remaining members of the recovery team arrived on the surface and left the mine site. The recovery was complete, and a person was assigned to guard the mine entrance.

Account of Simpson

James Simpson was the survivor located closest to the explosion scene. He was working two entries to the right, near the face of the No. 4 Right entry, and in the same line of crosscuts in which the explosion occurred. Simpson stated that he heard a loud noise and saw a ball of fire coming toward him. The explosion forces blew his hard hat off and his cap lamp went out.

He remembered coal and other objects hitting his face as he was thrown backwards. The entry immediately filled with smoke and Simpson began crawling along the rib, away from the roof bolting machine he was operating, and started calling for help. He recalled that the sound of the machine became fainter as he crawled away.

His next recollection was of regaining consciousness on the surface. He was treated with oxygen, lost consciousness again and was transported to the Barbourville Hospital for further treatment.

Account of Faulkner

David Faulkner, foreman, was in the No. 5 Right entry checking the face area when the explosion occurred. Faulkner's initial reaction was that the blast had shot through the coal into an open area. He stated that he called for James Simpson, who was between him and the blast. He traveled by scoop toward the No. 4 Right entry and found Simpson in the last open crosscut between the No. 4 and No. 5 Right entries. Faulkner told Simpson to calm down and wait while he went outside to unload his scoop bucket which he had just loaded with coal in the No. 5 face. He traveled to the outside, dumped the coal, and reentered the mine to assist Simpson. By then, Dennis Gray had entered the mine and had already placed Simpson in a scoop bucket. Faulkner and Gray immediately transported Simpson to the surface.

Simpson was given oxygen. Faulkner immediately went back underground to check on the drilling and shooting crew. He met Henry Miles, who stated that he encountered smoke as he was trying to find the drill crew. They returned to the surface and loaded three self-contained self-rescuers and a roll of ventilation curtain in the scoop bucket. By the time they reentered the mine, the smoke had cleared enough that they could see. Dennis Gray operated the scoop with Faulkner and Miles riding in the bucket. Gray parked the scoop in the No. 2 Right entry, one crosscut outby the accident site. Faulkner and Miles crawled to the drill crew's tractor at the accident scene and saw the partial remains of one of the victims believed to be Robert Cox. Faulkner crawled over to the scoop bucket which had been separated from the tractor by the explosion. He could not see anyone else, so he and Miles crawled back to where Gray was waiting in the scoop. There they met Robert Hembree, who had just arrived. Hembree instructed Gray to take Faulkner outside.

Account of Miles

Henry Miles was loading coal out of the No. 6 Right entry face at the time of the explosion. Miles stated he heard a loud

explosion and thought the blast had shot through on him. He covered his head and when he looked up he could see nothing but smoke. Miles said he could hear James Simpson calling for someone to help him. He traveled over to Simpson's location in the crosscut between No. 4 and 5 Right entries but could not transport Simpson because his scoop bucket was loaded with coal. He stayed with Simpson until Dennis Gray arrived at their location a short time later in another scoop. They put Simpson in the bucket and Gray, with Miles following, traveled outside. There, Miles and Gray were instructed by Hembree to reenter the mine to check on the drilling and blasting crew. Shortly after reentering the mine, Miles told Gray to go back outside and have the electrical power de-energized because they could still hear the roof bolting machine running. Miles crawled from his tractor to the scoop bucket at the accident scene and found it severely damaged. He determined that help would be needed and he returned to the surface and reported his findings to Hembree. Dennis Gray, Miles and David Faulkner reentered the mine and found what was believed to be the remains of Robert Cox in the drill crew's scoop tractor. They all returned to the surface. Then Miles and Hembree again returned underground to the accident scene but were unable to find the other two victims.

Account of Hembree

Robert Hembree, mine operator, was on the surface at the time of the accident. When he heard the explosion, he believed something was wrong because it was louder and had a different sound than a normally fired shot. He immediately told Dennis Gray, scoop operator, to go underground and check on the miners. Shortly thereafter, David Faulkner came outside and reported to him that James Simpson was overcome by smoke and that Henry Miles was attending him. Faulkner told Hembree he would dump his bucket of coal and return to get Simpson. Upon entering the mine, Faulkner met Gray and Miles with Simpson in the scoop bucket. They all traveled to the surface. They administered oxygen to Simpson. Hembree sent Faulkner, Miles, and Gray back underground to check on the drilling and shooting crew. Later, Hembree entered the mine and met Faulkner and Miles outby the accident scene. Hembree told Gray to take Faulkner to the surface because he appeared to be in shock. Hembree and Miles then crawled to the accident scene and, finding no survivors, returned to the surface.

After Hembree and Miles arrived on the surface, no further underground activity occurred until MSHA and Kentucky DMM&E personnel arrived at the mine.

PART III

Factors Involved

The investigation revealed the following factors relevant to the occurrence of the accident:

1. The orientation of the No. 1 Right entry had drifted off mine projections to such an extent that the crosscut turned to the right off this entry was aligned in a direction intersecting the last open crosscut rather than parallel to it.

2. The last open crosscut (No. 8) between Nos. 1 and 2 Right entries was mined off centerline in an inby direction.

3. The first borehole drilled in the slab-cut pattern used to blast the coal faces was commonly drilled on an angle which caused this hole to extend beyond the rib line.

4. There was only one surviving eyewitness to the multi-fatal accident, James A. Simpson, Jr., roof bolting machine operator. He was located approximately 130 feet away from the point where the explosives were detonated. He had visual contact with the shot firer's scoop immediately prior to the explosion. He recalled no indication of unusual actions by the drilling and shooting crew before the accident.

5. The height in the mine varied from 21 to 24 inches. Crawling in the mine is extremely physically demanding.

6. The main fan, located on the surface, remained operative during and after the explosion; however, a permanent stopping was blown out in the third open crosscut between the Nos. 1 and 2 Right entries. This stopping line separated the intake from the return entries. The mine fan exhausted approximately 22,000 CFM. Partially damaged permanent stoppings were repaired during the rescue and recovery and a perceptible movement of air was present in the last line of open crosscuts on the working section.

7. Line brattice material was not used in any of the entries to direct the ventilation to the working faces. After the explosion, the section foreman returned to the surface to obtain line brattice material to clear the smoke generated by the explosion.

8. Preshift and on-shift examinations were performed by the section foreman, David Faulkner. Faulkner would

enter the mine and travel to the working section in a permissible battery-powered scoop. Faulkner stated that he occasionally loaded coal from the working faces during the shift.

9. All employees and the operator, when interviewed, stated they never observed the drilling, loading, and blasting cycle. Blasting procedures were reconstructed from employee statements, observations made during the investigation underground at the accident site, in the working section, and in the surface explosives storage facilities.

10. Prior to the accident, David Faulkner delivered two cases of explosives to Ray Carpenter at the mouth of the 3-way face in No. 1 Right entry. Assuming nine or 10 boreholes per face with four explosive cartridges per borehole, the number of cartridges used per face was either 36 or 40. In the 3-way face of the No. 1 Right entry, the total number of cartridges used would vary from 108 to 120.

11. Each case of explosives contained 100 cartridges (50 pounds). After the 3-way face was loaded, at least 80 to 92 cartridges were unused and were present in the scoop bucket at the time of the accident.

12. The forces exerted by the accidental detonation of the explosives were greatest in the last open crosscut between the Nos. 1 and 2 Right entries. A depression of approximately 6 inches was present in the mine roof and floor at the accident site (See Appendix B).

13. The extent of damage to the bodies of the victims and the extensive damage to the scoop bucket indicate that the victims and the scoop were in close proximity to the greatest forces exerted by the explosives.

PART IV

Conclusion

The primary cause of the explosives accident was the failure of management to maintain sightlines or other methods of directional control in the No. 1 Right entry 3-way face on the 001 Section. This resulted in a reduction of the thickness of the coal pillar which separated the victims from the right hand crosscut of the 3-way face being blasted. The explosive forces penetrated this coal pillar and detonated the unused explosives located in the immediate vicinity of the victims.

Contributing factors to the occurrence of the explosion:

1. The last open crosscut (No. 8) between the Nos. 1 and 2 Right entries was mined to the left of center. This further reduced the thickness of the coal pillar which separated the victims from the right crosscut of the 3-way face.

2. Explosives, detonators, and miners were positioned in direct line of the resulting explosive forces when the No. 1 Right entry 3-way face was blasted. These forces penetrated the coal pillar.

3. Angle-boreholes in the blasting pattern were drilled beyond the rib line in the accident area.

4. Failure to alternate the slab-cut blasting pattern from the right to left rib on successive blasts contributed to a loss of directional control resulting in the development of entries and crosscuts off projected center-lines.

Violations

A total of 22 violations, observed on inspections of the 001 Section conducted in conjunction with the accident investigation, were issued. The following four violations contributed to the cause of the accident and were issued in association with the accident investigation:

1. 30 CFR 75.203(b) - Sightlines or other methods of directional control to maintain the projected direction of mining were not being used in the No. 1 Right entry 3-way face on the working section. Also, the last open crosscut between Nos. 1 and 2 Right entries was mined off centerline in an inby direction.

2. 30 CFR 75.1313(b)(2) - Explosives, detonators and miners were positioned in the direct line of the forces from blasting.

3. 30 CFR 75.1315(e) - Angle boreholes in the slab-cut blasting pattern used on the 001 Section were drilled beyond the rib line.

4. 30 CFR 1320(a) - A total of 27 to 30 boreholes were detonated simultaneously on the 001 Section when blasting a 3-way face. The operator did not have a permit from the District Manager to fire in excess of 20 boreholes.

Respectfully Submitted,

Charles E. McGraw
Subdistrict Manager,
District 5

Allyn C. Davis
Mining Engineer,
Division of Safety

Frank C. Young, Jr.
Supervisory Special Investigator,
District 5

Richard L. Fischer
Physical Scientist,
Denver Technology Center

Roy D. Davidson
Electrical Engineer,
District 5

Approved by:

Jerry L. Spicer
Administrator
for Coal Mine Safety and Health

APPENDIX A

List of Persons Providing Information and/or Present During The Investigation

Granny Rose Coal Company

Robert Hembree	Operator
David Faulkner	Section Foreman

Granny Rose Coal Company Employees

Dennis Gray	Scoop Operator
Robert Partin	Rock Picker
Ricky Lee Messer	Roof Bolting Machine Operator
Lester Michael Murphy	Scoop Operator
Donald Ray Gray	Mobile Equipment Operator
Henry E. Miles	Scoop Operator
James A. Simpson, Jr.	Roof Bolting Machine Operator

Person Regularly At Mine Site

Ronald Lee Gray	Equipment Owner/Leasor

Kentucky Department of Mines, Minerals and Energy

Leroy Gross	District Supervisor
Larry G. Stump	Safety Analyst
Ronald Ross	Electrical Inspector
Cecil Smith	Inspector
Jerry Holland	Inspector
Dill Finley	Inspector

Mine Safety and Health Administration

Charles E. McGraw	Subdistrict Manager, Dist. 5
Frank C. Young, Jr.	Staff Assistant/Supervisory Special Investigator, Dist. 5
Roy D. Davidson	Electrical Engineer, Dist. 5
Arnold D. Carico	Mining Engineer, Dist. 5
Benjamin S. Harding	Mining Engineer, Dist. 5
Allen Dupree	Mining Engineer, Pittsburgh Technical Support
Richard L. Fischer	Physical Scientist, Denver Technical Support
Allyn C. Davis	Mining Engineer, Arlington
Earnest C. Teaster, Jr.	Program Analyst, Arlington
Carl Charneski	Attorney, Office of the Solicitor, Arlington

No. 9 Crosscut

No. 1 Entry

Hole
Shot Through

Metal Scraps
Embedded in
Roof

Roof Bolts in
Place with
Plates Missing

Roof Bolt
Plate

Explosion Damage
Depression in
Floor and Roof

Metal
Scraps

Sheared Off
Roof Bolt Still
in Roof

Piece of
Cigarette Package
(Marlboro Lights)

APPENDIX B

MAP OF ACCIDENT AREA
GRANNY ROSE COAL COMPANY
NO. 3 MINE
I.D. 15-16719
BARBOURVILLE, KNOX COUNTY, KENTUCKY
JULY 31, 1990

No. 2 Entry

Bottom
of FSR

Metal
Scrap

Coal Drill
Bit

Metal
Scraps

Part of Cap
Light Battery
and
Metal Scrap

Metal
Scraps

Drill Handle
(18" Piece)

METAL
SCRAPS

Piece of
Rubber Tire

Piece of
Capliner
(10" Section)

Mescher
Mine
Tractor

Metal
Scraps

Piece of
Clothing
(3" x 5")

Metal
Scraps

End of Dodge
Coupling

Blue Plastic
(6" x 6" Piece)

Drill
Steel

Bottom
of FSR

Cap Light
Wires
(6" Piece)

Piece of Belt
Buckle

Scoop
Bucket

Miner's Belt
(2" Piece)

Coal Drill Bit
and
Metal Scrap

Metal
Scraps

No. 8 Crosscut

Frame and Wheel-
Unit to Drill

Drill Shaft

Piece of Cast
Aluminum Drill Case

Drill
Solenoid

2 Undetonated
Blasting Caps

Piece of Black Plastic
Miner's Cap (Left Side)

Wheel Off
Drill

Top of
FSR

Cable

Piece of
Rubber Tire

Cushion

Coupling
(1" Diameter)

Piece of Battery Light,
Leather Strap and
White Cloth

4 Pieces of Flat
Cable Intertwined

White
Plastic
(4" x 8")

Pieces of Blue
Plastic Cooler
(8" x 12")

Piece of Cap Light
and
Metal Scrap

Metal
Scrap

Bottom of FSR

Undetonated Blasting Cap

Piece of Nylon Web Miner's Belt

2 Pieces of Drive Belt

Ratchet Handle
and
Piece of Motor
Casing for Drill

Sole of
Rubber
Boot
(2 Pieces)

8" Piece of
Miner's Belt
and
Brass Tag
(Jack Lake
403-82-8633)

Undeto-
nated
Blasting
Cap

Tractor
Draw
Pin

Roof Bolt
Plate on Floor

FSR - Filter Type Self-Rescuer

Metal
Scrap

Part of
Cap Light
Battery
and
Roof Bolt Plate

Tractor
Draw
Bar

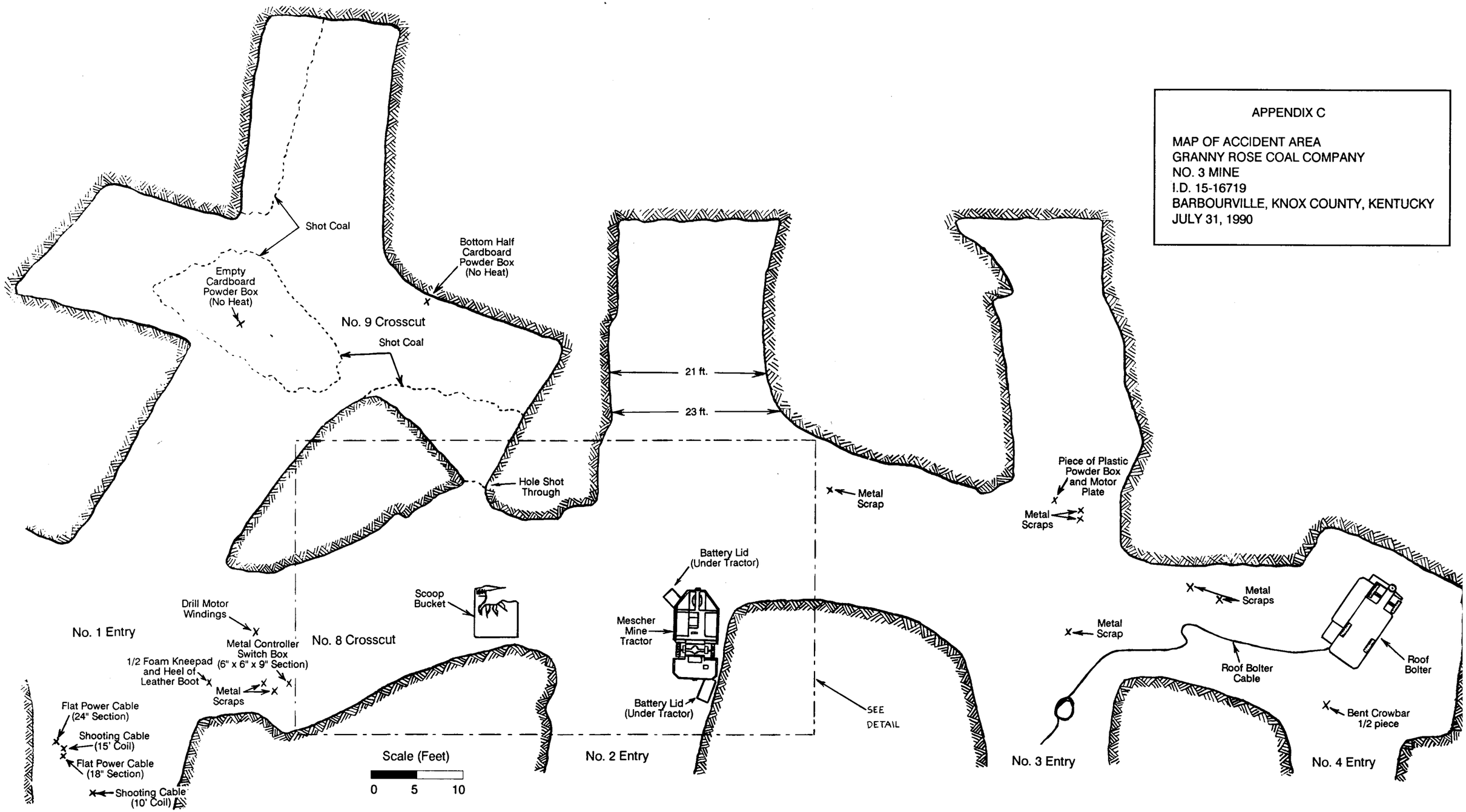
Brake
Pedal

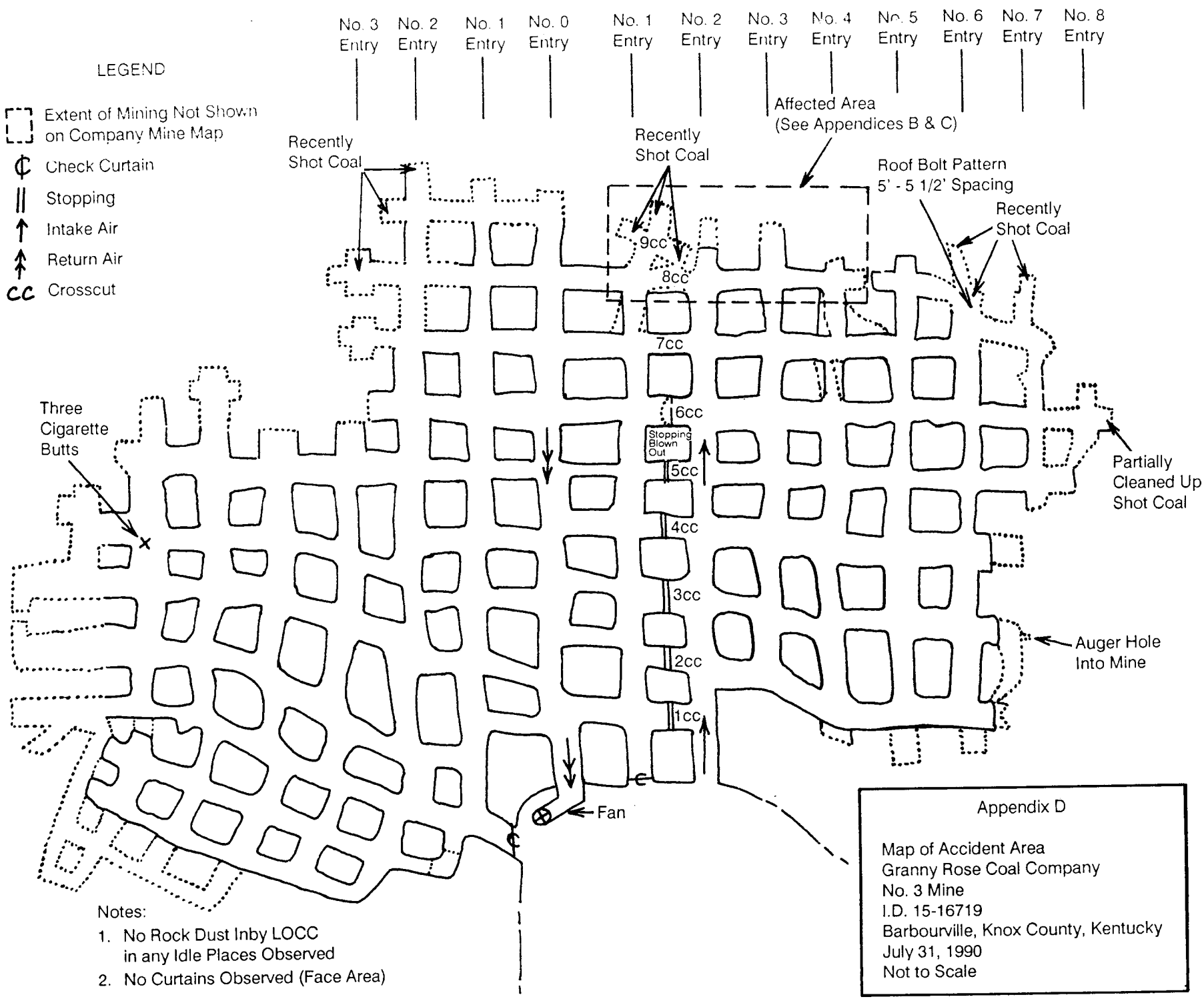
Scale (Feet)

0 2.5 5

APPENDIX C

MAP OF ACCIDENT AREA
GRANNY ROSE COAL COMPANY
NO. 3 MINE
I.D. 15-16719
BARBOURVILLE, KNOX COUNTY, KENTUCKY
JULY 31, 1990




No. 3 Entry
No. 2 Entry
No. 1 Entry
No. 0 Entry
No. 1 Entry
No. 2 Entry
No. 3 Entry
No. 4 Entry
No. 5 Entry
No. 6 Entry
No. 7 Entry
No. 8 Entry
LEGEND
Extent of Mining Not Shown on Company Mine Map
Check Curtain
Stopping
Intake Air
Return Air
Crosscut
Affected Area (See Appendices B & C)
Recently Shot Coal
Recently Shot Coal
Recently Shot Coal
Roof Bolt Pattern 5' - 5 1/2' Spacing
9cc
8cc
7cc
6cc
Stopping Blown Out
5cc
4cc
3cc
2cc
1cc
Three Cigarette Butts
Partially Cleaned Up Shot Coal
Auger Hole Into Mine
Fan
Notes:
1. No Rock Dust Inby LOCC in any Idle Places Observed
2. No Curtains Observed (Face Area)
Appendix D
Map of Accident Area
Granny Rose Coal Company
No. 3 Mine
I.D. 15-16719
Barbourville, Knox County, Kentucky
July 31, 1990
Not to Scale

Data Sheet

U.S. Department of Labor
Mine Safety and Health Administration

Section A–Victim Data

1. Name	2. Sex	3. Social Security Number
Robert Cox	☒ Male ☐ Female	375-84-7689

4. Age	5. Job Classification
26	Drillman

6. Experience at this Classification	7. Total Mining Experience
5 years	6 years

8. What activity was being performed at time of accident?	9. Victim's Experience at this Activity	10. Was victim trained in this task?
Unknown (probably present where shots were being detonated)	5 years	Yes

Section B–Victim Data for Health and Safety Courses/Training Received *(related to accident)*	Date Received
11. Newly Employed Experienced Miner	6/26/90
12. Task, Timberman and Scoop Operator	6/26/90
13.	
14.	

Section C–Supervisor Data *(supervisor of victim)*

15. Name	16. Certified
David Faulkner	☒ Yes ☐ No

17. Experience as Supervisor	18. Total Mining Experience
5-1/2 years	

Section D–Supervisor Data for Health and Safety Courses/Training Received *(related to accident)*	Date Received
19. Shot Firer	2/20/84
20.	
21.	
22.	

23. When was the supervisor last present at accident scene prior to the accident?	24. What did he do when he was there?
Between 12:30 p.m. and 1:00 p.m.	Delivered two cases of explosives to the mouth of No. 1 Entry (Right of Fan)

25. When was he last in contact with the victim?	26. Did he issue instructions relative to the accident?
Between 12:30 p.m. and 1:00 p.m.	No

27. Was he aware of or did he express an awareness of any unsafe practice or condition?

No

APPENDIX E

Data Sheet

U.S. Department of Labor
Mine Safety and Health Administration

Section A—Victim Data

1. Name	2. Sex	3. Social Security Number
Jack Lake	☒ Male ☐ Female	403-82-8633

4. Age	5. Job Classification
34	Shot Firer

6. Experience at this Classification	7. Total Mining Experience
13 years	16 years

8. What activity was being performed at time of accident?	9. Victim's Experience at this Activity	10. Was victim trained in this task?
Unknown (probably present where shots were being detonated)	13 years	Yes

Section B—Victim Data for Health and Safety Courses/Training Received *(related to accident)*	Date Received
11. Newly Employed Experienced Miner	6/26/90
12. Task, Timberman, Scoop Operator	6/26/90
13. Shot Firer	8/24/84
14.	

Section C—Supervisor Data *(supervisor of victim)*

15. Name	16. Certified
David Faulkner	☒ Yes ☐ No

17. Experience as Supervisor	18. Total Mining Experience
5-1/2 years	

Section D—Supervisor Data for Health and Safety Courses/Training Received *(related to accident)*	Date Received
19. Shot Firer	2/20/84
20.	
21.	
22.	

23. When was the supervisor last present at accident scene prior to the accident?	24. What did he do when he was there?
Between 12:30 p.m. and 1:00 p.m.	Delivered two cases of explosives to the mouth of No. 1 Entry (Right of Fan)

25. When was he last in contact with the victim?	26. Did he issue instructions relative to the accident?
Between 12:30 p.m. and 1:00 p.m.	No

27. Was he aware of or did he express an awareness of any unsafe practice or condition?

No

Data Sheet

U.S. Department of Labor
Mine Safety and Health Administration

Section A—Victim Data

1. Name: Ray Carpenter

2. Sex: ☒ Male ☐ Female

3. Social Security Number: 406-94-3207

4. Age: 31

5. Job Classification: Shot Firer

6. Experience at this Classification: 4 years

7. Total Mining Experience: 8 years

8. What activity was being performed at time of accident? Unknown (probably detonating shots)

9. Victim's Experience at this Activity: 4 years

10. Was victim trained in this task? Yes

Section B—Victim Data for Health and Safety Courses/Training Received *(related to accident)*	Date Received
11. Shotfirer	2/5/87
12.	
13.	
14.	

Section C—Supervisor Data *(supervisor of victim)*

15. Name: David Faulkner

16. Certified: ☒ Yes ☐ No

17. Experience as Supervisor: 5-1/2 years

18. Total Mining Experience

Section D—Supervisor Data for Health and Safety Courses/Training Received *(related to accident)*	Date Received
19. Shotfirer	2/20/84
20.	
21.	
22.	

23. When was the supervisor last present at accident scene prior to the accident? Between 12:30 p.m. and 1:00 p.m.

24. What did he do when he was there? Delivered two cases of explosives to the mouth of No. 1 entry (right of fan)

25. When was he last in contact with the victim? Between 12:30 p.m. and 1:00 p.m.

26. Did he issue instructions relative to the accident? No

27. Was he aware of or did he express an awareness of any unsafe practice or condition? No

Mine Citation/Order

U.S. Department of Labor
Mine Safety and Health Administration

Section I -- Violation Data

1. Date: Mo 12 Da 17 Yr 90 | 2. Time (24 Hr. Clock): 1600 | 3. Citation/Order Number: 3354301

4. Served To: ROBERT HEMBREE, OPERATOR | 5. Operator: GRANNY ROSE COAL COMPANY

6. Mine: NO. 3 MINE | 7. Mine ID: 15-16719 (contractor)

8. Condition or Practice | 8a. Written Notice (103g) ☐

Sightlines or other methods of directional control to maintain the projected direction of mining were not being used in the No. 1 Right entry 3-way developing faces of the 001 Section. The last survey station (spad) in this entry was located three crosscuts outby the face. Also, the last open crosscut between Nos. 1 and 2 Right entries was mined off centerline in an inby direction. This reduced the thickness of the coal pillar between the right face of the No. 1 Right entry 3-way and the adjacent, inby rib of the last open crosscut.

This condition caused the multi-fatal explosives accident.

This condition was determined by observations during the investigation of the accident involving explosives on July 31, 1990, which resulted in the deaths of three miners.

See Continuation Form (MSHA Form 7000-3a) ☐

9. Violation | A. Health ☐ Safety [X] Other ☐ | B. Section of Act | C. Part/Section of Title 30 CFR: 75.203(b)

Section II -- Inspector's Evaluation

10. Gravity:

A. Injury or Illness (has) (is): No Likelihood ☐ Unlikely ☐ Reasonably Likely ☐ Highly Likely ☐ Occurred [X]

B. Injury or Illness could reasonably be expected to be No Lost Workdays ☐ Lost Workdays or Restricted Duty ☐ Permanently Disabling ☐ Fatal [X]

C. Significant and Substantial (See Reverse): Yes [X] No ☐ | D. Number of Persons Affected: 5

11. Negligence (check one)

A. None ☐ B. Low ☐ C. Moderate ☐ D. High ☐ E. Reckless Disregard [X]

12. Type of Action: 104-d-1, | 13. Type of Issuance (check one): Citation [X] Order ☐ Safeguard ☐

14. Initial Action: A. Citation ☐ B. Order ☐ C. Safeguard ☐ D. Written Notice ☐ | E. Citation/Order Number | F. Dated Mo Da Yr

15. Area or Equipment

16. Termination Due | A. Date: Mo 01 Da 11 Yr 91 | B. Time (24 Hr. Clock): 0900

Section III -- Termination Action

17. Action to Terminate

18. Terminated | A. Date Mo Da Yr | B. Time (24 Hr Clock)

Section IV -- Automated System Data

19. Type of Inspection (activity code): AFA | 20. Event Number: 5852608 | 21. Primary or Mill

22. Signature: Frank A. Young, Jr. | 23. AR Number: 20986

MSHA Form 7000-3 Mar 85

Mine Citation/Order

U.S. Department of Labor
Mine Safety and Health Administration

Section I -- Violation Data

1. Date: Mo 12 Da 17 Yr 90 | 2. Time (24 Hr. Clock): 1603 | 3. Citation/Order Number: 3354302

4. Served To: ROBERT HEMBREE, OPERATOR | 5. Operator: GRANNY ROSE COAL COMPANY

6. Mine: NO. 3 MINE | 7. Mine ID: 15-16719 (contractor)

8. Condition or Practice | 8a. Written Notice (103g) ☐

Explosives, detonators and miners were positioned, in the direct line of the forces from blasting, in the last open crosscut between Nos. 1 and 2 Right entries on the 001 Section.

This was one of the factors that contributed to the multi-fatal explosives accident.

This condition was observed during the investigation of the accident involving explosives on July 31, 1990, resulting in the deaths of three miners.

See Continuation Form (MSHA Form 7000-3a) ☐

9. Violation | A. Health ☐ Safety ☒ Other ☐ | B. Section of Act: | C. Part/Section of Title 30 CFR: 75.1313(b)(2)

Section II -- Inspector's Evaluation

10. Gravity:

A. Injury or Illness (has) (is): No Likelihood ☐ Unlikely ☐ Reasonably Likely ☐ Highly Likely ☐ Occurred ☒

B. Injury or Illness could reasonably be expected to be No Lost Workdays ☐ Lost Workdays or Restricted Duty ☐ Permanently Disabling ☐ Fatal ☒

C. Significant and Substantial (See Reverse): Yes ☒ No ☐ | D. Number of Persons Affected: 5

11. Negligence (check one)

A. None ☐ B. Low ☐ C. Moderate ☐ D. High ☒ E. Reckless Disregard ☐

12. Type of Action: 104-d-1, | 13. Type of Issuance (check one): Citation ☐ Order ☒ Safeguard ☐

14. Initial Action: A. Citation ☒ B. Order ☐ C. Safeguard ☐ D. Written Notice ☐ | E. Citation/Order Number: 3354301 | F. Dated: Mo 12 Da 17 Yr 90

15. Area or Equipment: 001 Working Section

16. Termination Due: A. Date Mo Da Yr | B. Time (24 Hr. Clock)

Section III -- Termination Action

17. Action to Terminate

18. Terminated: A. Date Mo Da Yr | B. Time (24 Hr Clock)

Section IV -- Automated System Data

19. Type of Inspection (activity code): AFA | 20. Event Number: 5852608 | 21. Primary or Mill

22. Signature: Frank C. Young, Jr. | 23. AR Number: 20986

MSHA Form 7000-3 Mar 85

Mine Citation/Order

U.S. Department of Labor
Mine Safety and Health Administration

Section I -- Violation Data

1. Date (Mo / Da / Yr)	2. Time (24 Hr. Clock)	3. Citation/Order Number
12/17/90	1606	3354303

4. Served To: ROBERT HEMBREE, OPERATOR

5. Operator: GRANNY ROSE COAL COMPANY

6. Mine: NO. 3 MINE

7. Mine ID: 15-16719 (contractor)

8a. Written Notice (103g) ☐

8. Condition or Practice

Angle boreholes in the slab cut blasting pattern used on the 001 Section were drilled beyond the rib line. This was one of the factors contributing to the multi-fatal explosives accident.

This practice was determined by interviews with mine employees and by physical evidence observed underground during the investigation of the July 31, 1990, accident involving explosives which resulted in the deaths of three miners.

See Continuation Form (MSHA Form 7000-3a) ☐

9. Violation: A. Health ☐ Safety ☒ Other ☐ — B. Section of Act: - - — C. Part/Section of Title 30 CFR: 75.1315(e)

Section II -- Inspector's Evaluation

10. Gravity:

A. Injury or Illness (has) (is): No Likelihood ☐ Unlikely ☐ Reasonably Likely ☐ Highly Likely ☐ Occurred ☒

B. Injury or Illness could reasonably be expected to be No Lost Workdays ☐ Lost Workdays or Restricted Duty ☐ Permanently Disabling ☐ Fatal ☒

C. Significant and Substantial (See Reverse): Yes ☒ No ☐ — D. Number of Persons Affected: 5

11. Negligence (check one) A. None ☐ B. Low ☐ C. Moderate ☐ D. High ☐ E. Reckless Disregard ☒

12. Type of Action: 104-d-1, - -

13. Type of Issuance (check one) Citation ☐ Order ☒ Safeguard ☐

14. Initial Action A. Citation ☒ B. Order ☐ C. Safeguard ☐ D. Written Notice ☐ — E. Citation/Order Number: 3354301 — F. Dated (Mo Da Yr): 12/17/90

15. Area or Equipment: 001 Working Section

16. Termination Due A. Date (Mo Da Yr) — B. Time (24 Hr. Clock)

Section III -- Termination Action

17. Action to Terminate

18. Terminated A. Date (Mo Da Yr) — B. Time (24 Hr Clock)

Section IV -- Automated System Data

19. Type of Inspection (activity code): AFA

20. Event Number: 5852608

21. Primary or Mill

22. Signature: Frank C. Young, Jr.

23. AR Number: 20986

MSHA Form 7000-3 Mar 85

Mine Citation/Order

U.S. Department of Labor
Mine Safety and Health Administration

Section I -- Violation Data

1. Date: Mo 12 Da 17 Yr 90 | 2. Time (24 Hr. Clock): 1609 | 3. Citation/Order Number: 3354304

4. Served To: ROBERT HEMBREE, OPERATOR | 5. Operator: GRANNY ROSE COAL COMPANY

6. Mine: NO. 3 MINE | 7. Mine ID: 15-16719 (contractor)

8. Condition or Practice | 8a. Written Notice (103g) ☐

A total of 27 to 30 boreholes were detonated simultaneously on the 001 Section when blasting 3-way faces. The operator did not have a permit from the District Manager to fire in excess of 20 boreholes. This was one of the factors that contributed to the multi-fatal explosives accident.

This practice was determined during investigation interviews with mine employees about the July 31,1990, accident involving explosives which resulted in the deaths of three miners.

See Continuation Form (MSHA Form 7000-3a) ☐

9. Violation | A. Health ☐ Safety [X] Other ☐ | B. Section of Act: - - | C. Part/Section of Title 30 CFR: 75.1320(a)

Section II -- Inspector's Evaluation

10. Gravity:
A. Injury or Illness (has) (is): No Likelihood ☐ Unlikely ☐ Reasonably Likely ☐ Highly Likely ☐ Occurred [X]

B. Injury or Illness could reasonably be expected to be No Lost Workdays ☐ Lost Workdays or Restricted Duty ☐ Permanently Disabling ☐ Fatal [X]

C. Significant and Substantial (See Reverse): Yes [X] No ☐ | D. Number of Persons Affected: 5

11. Negligence (check one)
A. None ☐ B. Low ☐ C. Moderate ☐ D. High ☐ E. Reckless Disregard [X]

12. Type of Action: 104-d-1, - - | 13. Type of Issuance (check one): Citation ☐ Order [X] Safeguard ☐

14. Initial Action: A. Citation [X] B. Order ☐ C. Safeguard ☐ D. Written Notice ☐ | E. Citation/Order Number: 3354301 | F. Dated: Mo 12 Da 17 Yr 90

15. Area or Equipment: 001 Working Section

16. Termination Due | A. Date: Mo Da Yr | B. Time (24 Hr. Clock)

Section III -- Termination Action

17. Action to Terminate

18. Terminated | A. Date: Mo Da Yr | B. Time (24 Hr Clock)

Section IV -- Automated System Data

19. Type of Inspection (activity code): AFA | 20. Event Number: 5852608 | 21. Primary or Mill

22. Signature: Frank C. Young, Jr. | 23. AR Number: 20986

MSHA Form 7000-3 Mar 85