

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION
UNDERGROUND MINE COAL DUST EXPLOSION

No. 11 Mine (ID No. 15-02290)
Adkins Coal Company
Kite, Knott County, Kentucky

December 7, 1981

by

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ABSTRACT

This report is the result of an investigation by the Mine Safety and Health Administration (MSHA) made pursuant to section 103(a) of the Federal Mine Safety and Health Act of 1977 (Mine Act), Public Law 91-173, as amended by Public Law 95-164, 30 U.S.C. 813(a) (Supp. IV, 1980).

On Monday, December 7, 1981, at approximately 2:50 p.m., a coal dust explosion occurred on the south main working section at the No. 11 mine, Adkins Coal Company, located at Kite, Knott County, Kentucky. The accident resulted in the death of all eight (8) miners who were underground at the time. The names, ages, occupations and mining experiences of the victims are contained in Appendix A.

The accident occurred while the face and right crosscut were being blasted simultaneously from the solid in the No. 1 entry of the active working section. The investigation revealed that a train of explosives, at least 74 inches in length, in the second hole from the right rib of the No. 1 entry face, failed to detonate. This failure provided too much burden for the rib hole to pull, causing the rib hole to blow out, igniting the coal dust which was in suspension from the blast of the other holes and the dust in suspension which had been previously deposited on the floor, roof and ribs from earlier mining operations. Evidence indicated that it was a practice not to use stemming in the blast holes and that each hole was loaded to or near the hole collar with explosives.

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PART I

GENERAL INFORMATION

General Information

The 007 section of the No. 11 mine is located on Potato Branch, off Right Beaver Creek, near Kite, Knott County, Kentucky, approximately 1 mile off State Highway 7. On September 10, 1979, the mine operator filed a legal identity form with the Mine Safety and Health Administration (MSHA) which listed the corporation name as the Adkins Coal Company. During the investigation, the operator maintained that the mine was operated by Incoal, Incorporated. An appropriate citation was issued during the investigation for failure to file a correct notification and every change thereof of legal identity with MSHA. During the investigation, the accountant for the company explained the relationship between Adkins Coal Company and Incoal, Incorporated, as follows:

Adkins Coal Company is a general partnership and the partners are Orville Adkins, Dixie Adkins, Adam Adkins and Sally Adkins. Adkins Coal Company subleases certain minerals consisting of approximately 360 acres of Elkhorn Seam No. 3 and 200 acres of Elkhorn Seam No. 1 from Island Creek Coal Company. These properties are located on Sly Branch, Knott County, Kentucky.

Incoal, Incorporated, is a Kentucky corporation and the stockholders are the same persons as the partners of the Adkins Coal Company. Incoal, Incorporated, also subleases certain minerals consisting of approximately 1,000 acres of Elkhorn Seam No. 1 from the Island Creek Coal Company, and this mineral is also located in Knott County.

Adkins Coal Company does not mine coal; the company contracts Incoal to mine the coal on its subleases. Incoal, Incorporated, was formed in August 1969 and Adkins Coal Company started in June 1974. The coal being mined at the time of the explosion was produced from the mineral subleased by Incoal, Incorporated.

In addition to leasing the mineral to Incoal, Incorporated, Island Creek Coal Company provided engineering services for the operator. These services consisted of underground surveys, providing a mine map showing the mine layout and a mining plan for the development of the active working places.

The mine management officials of the 007 section of the No. 11 mine at the time of the explosion were:

Harold Baldridge	Mine Superintendent
John Ellis Bates	Mine Foreman
Bobby Slone	Foreman

The No. 11 mine had 2 active working sections, identified as the 006 and 007, and a preparation plant. The 2 working sections were not physically connected underground. The accident occurred on the 007 working section.

The 007 working section of the mine was opened in 1978 by 3 drifts into the Elkhorn No. 1 coalbed. At the third crosscut (250 feet in by the portal), 3 additional entries were developed and a 6-entry system was used throughout the mine. The Nos. 5 and 6 entries were used for main intake aircourses and the Nos. 1 and 2 entries were return aircourses. The Nos. 3 and 4 entries were separated from these aircourses by concrete block stoppings which isolated the travelway and the conveyor belt entry from the aircourses. The coalbed averaged about 31 inches in thickness and was relatively level.

A total of 23 persons, 20 working underground, were employed on 2 coal-producing shifts, 5 days a week. The average daily production reportedly was 450 tons of coal. The immediate roof overlying the coalbed was shale and sandstone, and the floor was fireclay.

During the investigation, a standard channel sample of coal was taken by MSHA in the working place of the No. 1 entry of the south main entries. The sample was analyzed by the Industrial Safety Division Laboratory, Bruceton Safety Technology Center, Pittsburgh, Pennsylvania. The proximate analysis of the channel sample was as follows:

	<u>Percent</u>
Moisture	2.6
Volatile matter	34.2
Fixed carbon	54.7
Ash	8.5

Numerous tests by the Bureau of Mines have established that coal dust having a volatile ratio of 0.12 and higher is explosive. The volatile ratio of the coal in the face area of the 007 section from the analysis of the sample was 0.39. The coal dust is therefore highly explosive. The volatile ratio is the ratio of volatile matter to fixed carbon plus volatile matter:

$$VR = \frac{v}{fc + v}$$

The last MSHA inspection of the entire Adkins No. 11 mine was conducted October 7-22, 1981. This inspection covered both the 006 and 007 working sections. A total of 7 citations were issued, 4 in the underground workings of the 007 section.

Mining Methods, Conditions and Equipment

Mining Methods

The method of mining being followed in the section where the accident occurred consisted of 6 entries with a projected width of 22 feet on 60-foot centers and connecting crosscuts on 60-foot centers and 22 feet in width. The pillars established by this development were not recovered.

Generally, the immediate roof over the coalbed was 10 feet of shale and sandstone and the main roof was sandstone. Roof bolts, 30 inches in length, were the only means of roof support used in the immediate area of the accident and the roof bolting was done according to an MSHA-approved roof control plan. The mine roof in the accident area appeared to be adequately supported.

Ventilation and Examinations

Mine ventilation was induced by a 6-foot propeller-type exhaust fan installed on the surface in a fireproof housing constructed of sheet metal which connected it to the No. 3 entry. The fan was driven at 1760 rpm by a 20-horsepower electric motor and developed a pressure of 0.5 inches of water. During the last inspection of the entire mine conducted October 7-22, 1981, approximately 15,642 cubic feet of air per minute (cfm) was measured in the intake entries at the last permanent stopping. Approximately 9020 cfm of air was measured in the immediate return of the working section and 76,400 cfm was measured in the main return at the mine fan. The analyses of air samples taken at these locations did not reveal any methane in the mine.

The 007 section was being developed with 6 entries. Intake air entered the mine from the surface through the No. 5 east main entry and returned out the No. 3 entry. At the third crosscut underground, an additional intake entry (No. 6 entry) was developed. The south main entries were developed off the east main, the Nos. 5 and 6 entries were intake entries, and the Nos. 1 and 2 entries were return aircourses.

The belt conveyor entered the mine in the No. 4 entry of the east main entries. In the south main entries, the belt conveyor was installed in the No. 3 entry, and the air used to ventilate the belt entry was coursed directly into the return aircourse near the section loading point. The No. 4 entry was isolated in the same air current as the conveyor belt. Two escapeways were maintained, one of which was ventilated with intake air.

Permanent stoppings, constructed of concrete blocks, were used to provide the required separation between the various aircourses. According to the ventilation plan approved for the mine, line brattice and check curtains were required to direct the ventilating air currents in the working places.

A mine map showing air flow directions, air quantities, other information gathered from previous inspections, inspectors' notes, and during the investigation is in Appendix J.

According to the mine record books, preshift, on-shift and weekly examinations were made by certified persons. The results of these examinations were recorded in approved books.

A Ventilation System and Methane and Dust Control Plan for the mine was approved July 16, 1981.

Coal Dust

The primary means for rendering coal dust inert was by applying rock dust. While developing the working places, rock dust was applied by hand and periodically a portable rock dust machine was used to dust the entries again. Loose coal, including coal dust, was shoveled by hand into the roadways along the entries where scoops picked it up and loaded it onto the belt conveyor.

The approved Ventilation System and Methane and Dust Control Plan required that dust on the roadways be controlled by water and calcium chloride. The plan also required that dust be controlled at the transfer points, loading points, underground dumps, along the belt line and at belt drives, in the face areas and along the roadways by ventilation, water, calcium chloride, rock dust and a company clean-up program.

During the inspection of the entire mine made in October of 1981, a mine dust survey was not conducted because the survey area of the mine was too wet to collect samples. However, spot samples were taken during an inspection made in June 1981. These samples resulted in the issuance of a section 104(d)(1) unwarrantable citation because the analyses of the samples revealed that the incombustible content was less than that required by the regulations. The condition was subsequently corrected.

A waterline, 2-inches in diameter, paralleled the belt conveyor, and outlets were provided as required by the regulations. A water tank mounted on skids was located at the section loading point for use in sprinkling roadways. There were several areas in the mine where accumulations of water were present; these areas are shown on the mine map provided in Appendix K.

Explosives

Blasting supplies were delivered to the mine from a central storage magazine which was used to store explosive supplies for this and other mines operated by the company. The explosives were manufactured by Independent Explosives, Incorporated; the type used was a granular based Permissible E. Each of the original paper shipping cartons contained 50 pounds of 1-1/2- by 12-inch cartridges. The permissible electric blasting caps used to initiate the explosives were manufactured by the Du Pont Company. The caps had 12-foot iron leg wires and the mine utilized millisecond delay periods numbered 1 through 9. The No. 1 cap had a nominal delay time of 25 milliseconds and the No. 9 had a delay time of 700 milliseconds for a total delay period of 675 milliseconds. The explosives were detonated by a 20-shot permissible blasting unit. Reportedly, the explosives were transported underground in the original containers by being placed in the bare metal bucket of a battery-powered scoop. Two explosives storage magazines were located about 400 feet outby the face in a crosscut between Nos. 1 and 2 entries.

Coal was blasted from the solid face by certified shot firers using a method commonly called "slab shooting." When using this method, the breaker hole is drilled at an angle of about 45 degrees toward the rib from a point along the face to a depth that would cause the shot to pull the coal to develop a straight rib and a second free-face. The remaining holes are then drilled across the face while continually lessening the angle until the rib hole on the other side of the entry is drilled straight into the face so that a straight rib will be formed that will be flush with the existing rib. In preparing the places to be blasted, there were 7 to 9 blast holes drilled about 30 inches apart, ranging in depth from 4 to 10 feet in both the entries and crosscuts. See Appendix E for a typical sketch for hole placement for slab shooting off the solid.

Electricity

Ungrounded, 480-volt, 3-phase power was purchased from the Kentucky Power Company at a metering point near the mine portal. From the metering point, 480-volt, 3-phase power was furnished to the following electric equipment which was located on the surface: 5 battery chargers, the mine fan, the surface conveyor belt drive unit and a shop-made safety center.

The safety center was intended to provide the required protective features for the 480-volt, 3-phase underground distribution circuit. The safety center contained a zig-zag transformer to derive a neutral for the system. The derived neutral was properly grounded through a 15-ampere, current-limiting resistor. A grounding circuit, originating at the grounded side of the current-limiting resistor, was used to ground the frames of all underground electric equipment supplied from the system. However, the frames of the surface equipment receiving power from the system were not grounded to the grounded side of the current-limiting resistor.

A 225-ampere, molded-case circuit breaker in the safety center was equipped with a ground-check circuit and devices to provide short-circuit, grounded-phase and undervoltage protection for the underground distribution circuit. However, when tested during the investigation, the grounded-phase protective device was inoperative. Moreover, the safety center was installed in such a manner that the underground distribution circuit was not protected from the effects of a grounded-phase condition in any of the circuits supplying 480-volt, 3-phase power to the surface equipment. A 3-pole disconnect switch was provided in conjunction with the circuit breaker in the safety center to serve as a visual disconnecting device for the underground distribution circuit.

From the safety center, the underground distribution circuit entered the mine through the No. 4 (belt conveyor) entry and supplied 480-volt, 3-phase power to an underground belt conveyor drive unit located approximately 700 feet in by the portal and a portable power center located in the 007 section. The underground distribution circuit consisted of approximately 2,050 feet of No. 1/0 AWG, 3-conductor, type G-GC cable which was installed on the mine floor. A one-line diagram of the underground distribution circuit at the time of the explosion is contained in Appendix D.

The portable power center located in the 007 section was manufactured by Porter Industries, Incorporated, and contained a 150 kVA, 480 VAC to 240 VAC, 3-phase transformer, which was connected delta/delta. A neutral for the secondary system was derived by a zig-zag transformer. The neutral was properly grounded to the frame of the power center through a 15-ampere, current-limiting resistor. The frames of all equipment supplied from the power center were properly grounded to the grounded side of the current-limiting resistor.

The power center contained two 240-volt, 3-phase outlets; one was used to supply 240-volt, 3-phase power to the coal drilling machine on the section and the other was used to supply 240-volt, single-phase power to a water pump located in the worked-out rooms to the right of the south main entries. Each circuit was protected by a molded-case circuit breaker which was equipped with a ground-check circuit and devices to provide short-circuit, grounded-phase and undervoltage protection for the circuit. However, the ground-check circuit for the coal drilling machine had been rendered inoperative by shorting the ground-check pin to the grounding pin in the receptacle on the power center.

The power center also contained a 150 KW rectifier bridge and one 300-volt, direct-current outlet which was used to supply power to the roof bolting machine on the section. The roof bolting machine trailing cable was protected against short circuits by a molded-case circuit breaker.

Cable couplers were provided in conjunction with each of the 3 circuit breakers in the power center to provide visual evidence that the power was disconnected when the cable plug was withdrawn from the receptacle.

Single-phase, 240-volt power was conducted to the nonpermissible water pump by a No. 12 AWG, 3-conductor with ground cable. Three-phase, 240-volt power was conducted to the coal drilling machine by a No. 10 AWG, 5-conductor, trailing cable. Three hundred-volt, direct-current power was conducted to the roof bolting machine by a No. 4 AWG, 2-conductor, type G trailing cable.

The electric equipment used on the 007 section consisted of the following:

1. Three Elkhorn Industrial Products Model AR-4 battery-powered scoops, MSHA Approval No. 2G-2271;
2. One Galis Model 300 roof bolting machine, MSHA Approval No. 2F-2070-A;
3. One Click Welding Shop Model P3-27 coal drilling machine, MSHA Approval No. 2G-2436-1; and,
4. One spare Click Welding Shop Model P3-27 coal drilling machine (MSHA approval plate missing).

The electric equipment and circuits underground were examined and/or tested during the investigation. There were violations pertaining to the electric equipment and circuits; however, the results of tests and examinations conducted by MSHA investigators established that the electric equipment and circuits were not factors in the explosion.

Transportation

Coal was loaded and transported from the face by rubber-tired battery-powered scoops. The scoops discharged the coal onto a belt conveyor which transported the coal to the surface. When the coal reached the surface, it was trucked to a nearby tippie or to a preparation plant several miles away. Both of the loading facilities were served by the Chessie Railroad System. Scoops were also used to transport the miners and the mine supplies in and out of the mine.

Communication

The mine communication system consisted of permissible telephones installed on the surface in the shop near the portal and underground at the belt transfer point and at the belt dumping point. A commercial telephone was provided in the surface repair shop.

Training Program and Medical Assistance Program

On January 11, 1979, the operator submitted a training and retraining plan, which was approved on January 16, 1979, that met the requirements of 30 CFR 48. The operator had contracted the Industrial Education Corporation of Pikeville, Kentucky, to train the employees at this mine. Refresher training was provided for the employees on November 6 and 11, 1981, and the miners were instructed in the safe use and handling of explosives at that time.

The operator had made arrangements with the McDowell Appalachian Regional Hospital of McDowell, Kentucky, for emergency medical treatment for the employees and with the County Wide Ambulance Service of Hindman, Kentucky, for ambulance service.

Illumination and Smoking

Illumination was provided on the mobile electric equipment by permissible lighting systems mounted on the equipment. Permissible battery-powered cap lamps were worn by the miners.

Several of the victims had smoking articles in their possession, in pockets of jackets which were not being worn at the time of the explosion and in lunch buckets. There were several loose cigarettes, 1 empty cigarette package, and cigarette butts found in the last open crosscut from the No. 2 entry to the No. 5 entry. The pathologist's report stated 2 victims had smoking materials in their clothing pockets.

A plan for searching persons entering the underground area for smoking materials was submitted by the operator on January 19, 1979. Due to the quantity of smoking material found in the pockets and lunch buckets of the victims, and scattered across the last open crosscut, it was evident that the searches were inadequate. It was apparent that smoking underground was a practice; however, smoking was not considered a factor in the explosion.

Fire Protection

The operator's program of instruction for the miners, including the location and use of all firefighting equipment, location of escapeways, exits and routes of travel and evacuation procedures, was approved by the District Manager. According to mine records, all escapeways were examined on December 4, 1981, and the results were recorded in a book located on the surface. Mine records indicated that a fire drill, including an evacuation, was performed on October 1, 1981.

Dry chemical fire suppression systems were provided on all the mobile electric face equipment that used hydraulic oil. The tanks supplying the systems had a rated capacity of 20 pounds. Fire extinguishers of the proper rating were located at all electrical installations, and at oil storage areas and at surface areas where they were required. The belt conveyors were continuously monitored for fire by sensor systems utilizing point-type heat sensors. Belt conveyor drives were protected by water deluge systems.

A 2-inch waterline was installed along the conveyor belt entry. Outlets and fire hose of a sufficient length to reach between each outlet were provided.

Mine Rescue

The operator had made arrangements with the Kentucky Department of Mines and Minerals to provide mine rescue capability for the mine while miners were underground. The mine rescue station and the necessary equipment for serving the mine was located at Martin, Kentucky.

Each miner at the mine was provided with a 1-hour, filter-type self-rescuer and had been trained in the use of the device. A check-in and check-out system was maintained in the repair shop, which utilized a check board and tags corresponding to similar tags worn on the miners' belts.

PART II

EXPLOSION AND RECOVERY OPERATIONS

Participating Organizations

Officials of the organizations which assisted in directing the recovery operations included: Orville Adkins, Company President; Willard Stanley, Commissioner, Kentucky Department of Mines and Minerals; L. D. Phillips and Jerry L. Spicer, MSHA District Managers, Districts 6 and 7, respectively.

Four mine rescue teams participated in the underground recovery operations:

Kentucky Department of Mines and Minerals, two Martin Teams
Kentucky Department of Mines and Minerals, Hazard Team
Kentucky Department of Mines and Minerals, Pikeville Team

In addition to the 4 teams from the Kentucky Department of Mines and Minerals, a team from Island Creek Coal Company and one from National Mines Corporation were present; however, neither of these teams went underground during the recovery. The names of the mine rescue team members and the persons who participated in the recovery operations are listed in Appendix B.

Mining Conditions Immediately Prior to the Explosion

Records indicate that the day shift (6 a.m. to 2 p.m.) mine foreman made a preshift examination of the working section and reported no unsafe conditions.

The day shift drill crew drilled the face of a crosscut in the No. 1 entry. Due to malfunction of the drill, they did not drill the face of No. 1 entry. The drill crew removed the trailing cable from the drill and installed it on the extra drill that was present on the section. However, they did not have time to complete the splicing of the cable before the end of the shift. Other than this occurrence, the day shift foreman reported no unusual occurrence on the shift prior to the explosion.

Activities of MSHA Personnel

On the day of the accident, the Subdistrict inspectors and supervisors were attending a staff meeting at the Subdistrict office at Hazard, Kentucky. About 3 p.m., Adam Adkins, Vice President, informed Dwight Greenlee, Subdistrict Manager, that there had been an explosion at the No. 11 mine, Adkins Coal Company. Greenlee instructed Coal Mine Inspectors Stanley Allen, Jr., and Clarence Ritchie to go to the mine immediately. Greenlee made assignments to other inspectors and notified Jerry Spicer, District Manager, District 7, in Barbourville, Kentucky, of the explosion. After making the assignments, Greenlee and Acting Coal Mine Inspection Supervisor Jeff Ison, Jr., traveled to the mine. At 4 p.m. Spicer called Joseph A. Lamonica, Administrator for Coal Mine Safety and Health,

Arlington, Virginia, and informed him of the explosion.

The MSHA mine rescue teams in Morgantown, West Virginia, and Pittsburgh, Pennsylvania, were placed on standby for possible deployment to the mine. Later that day, it was determined that there were sufficient mine rescue teams available for the recovery operations and the MSHA rescue teams were removed from standby status.

Allen arrived at the mine about 4 p.m. and soon thereafter Ritchie arrived. They observed smoke emitting from the mine fan discharge. They removed and tagged out the electrical power circuit entering the underground area of the mine and began monitoring the fan discharge. At this time, the return air from the mine showed 1000 parts per million (ppm) of carbon monoxide (CO) and other varying amounts of combustible gases. Ritchie issued a section 103(k) Order covering the entire mine to insure the safety of any person in the mine, and to require the operator to obtain the approval of MSHA of any plan to recover any person in the mine or to return the affected areas of the mine to normal.

About 4:10 p.m., Greenlee and Ison arrived at the mine and Greenlee assumed direction of MSHA personnel. Greenlee instructed Ison to monitor the mine return air and to guard the mine entrances and electrical power circuits entering the mine. A State mine rescue team from Martin was present under the supervision of Commissioner Willard Stanley. The rescue team was preparing to go underground. After the first mine rescue team entered the mine about 4:55 p.m., Greenlee called the District and reported the conditions that were present at the mine. The District personnel informed him to call the Arlington headquarters office to notify the Administrator of the developments and to report such information periodically as to the conditions and developments as they occurred.

At 5:18 p.m., Lamonica telephoned L. D. Phillips, District Manager, District 6, Pikeville, Kentucky, and instructed him to proceed to the mine to aid and assist in the rescue operations. At 8:30 p.m., Spicer arrived at the mine and assumed supervision of MSHA personnel. At 9:30 p.m., Coal Mine Inspector Ed Morgan and Coal Mine Inspection Supervisor Kenneth Howard of the District office arrived at the mine. All MSHA personnel remained at the mine and participated in the recovery.

At 4:15 p.m., on December 7, 1981, the Technical Support Mine Emergency Advisory Team was notified of the explosion at the mine. At the time, the team was on an assignment monitoring a mine fire at Vansant, Virginia. They were instructed to take the gas analysis van to the Adkins mine site. They arrived at the mine site at 11:30 p.m. where they were informed by Spicer that 7 of the 8 bodies had been located. The body of the eighth victim was found shortly thereafter. At 12:30 a.m., on December 8, 1981, Robert G. Peluso, Chief of the Pittsburgh Health Technology Center, directed the team to return to their previous assignment at Vansant, Virginia.

At 4:15 p.m., on December 7, 1981, the Mine Emergency Operations (MEO) facility at Hopewell, Pennsylvania, was instructed to send the communications van to the mine site. While traveling to the mine site, the MEO team was stopped near Charleston, West Virginia, and was instructed to return to the Hopewell facility because the van was not needed.

The Explosion and Recovery Operations

The evening shift crew entered the mine on Monday, December 7, 1981, at 2 p.m., and was transported by scoops to the south main active working section, a distance of about 2,300 feet from the surface. The crew members arrived on the section about 2:15 p.m. and began their assigned duties. The drill crew drilled the face of No. 1 entry and then moved the drill to the face of the No. 2 entry. The shot firer charged the blast holes in the right crosscut off the No. 1 entry, and then charged and made ready for blasting the holes in the face of the No. 1 entry. The roof bolt machine operator was drilling a roof bolt hole in the open crosscut between the Nos. 2 and 3 entries.

Roy Conley, Scoop Operator, had hauled 2 loads of coal out of No. 5 entry when the scoop he was operating developed a mechanical problem; he returned to the surface for repairs. About 2:50 p.m., while standing outside the mine shop where Larry Bentley, Repairman, was working on the scoop, Conley heard a noise coming from the nearby drift opening. He described this noise as a continuous "whoosh" and upon hearing it, he stepped inside the shop. Looking toward the mine portal, he saw mud, water and other debris coming out of the mine due to the forces generated by the explosion. Conley was not injured by the explosion. The mine fan continued to operate after the explosion. Recognizing that something unusual had occurred, Conley immediately attempted to contact Dillard Ashley, General Laborer, who was normally located at the section loading point.

While Conley was trying to contact the loading point, Bentley telephoned Adkins Coal Company officials who were at the Sly Branch mine, another company mine in the vicinity. Bentley informed Adam Adkins, Vice President, and Harold Baldrige, Mine Superintendent, that "the Potato Branch mine had blown up". Adkins, Baldrige and 4 repairmen rushed to the mine site, arriving about 3 p.m. Immediately Adkins began telephoning the local offices of MSHA, the Kentucky Department of Mines and Minerals, nearby mining operations which had mine rescue teams, and local rescue squads and ambulance service companies.

The first mine rescue team to arrive on the scene was the State team from Martin. The team members began to arrive at the mine about 3:30 p.m., but because a backup team was not present, they did not enter the mine until the State team from Hazard arrived.

At 4:55 p.m., the Martin team, captained by Larry Sexton, entered the mine bare-faced and explored the No. 5 intake air entry to the point where the No. 6 entry was started and then examined both entries inby toward the intersection of east main and south main entries. They went

through the first available man door in the brattice line separating the intake entries from the belt entry and made tests for oxygen deficiency, carbon monoxide and flammable gases. During this examination, the team found no harmful gases or smoke. The team returned to the intake entries and continued to explore. Upon reaching the intersection of the entries, they continued to explore the Nos. 3 and 4 east main entries and explored the area where the belt from the surface and the working section intersected. There was evidence of the forces from the explosion in this area; a portion of the east main belt had been forced from its normal position on the belt rollers and was almost perpendicular to the mine floor, and a concrete block stopping inby the belt tailpiece was partially blown out.

During this exploration, the team had crawled through 3 or 4 locations where water had accumulated on the mine floor and their clothes had become soaked. Due to the wet condition of their clothing, they decided to return to the surface and called outside and informed Stanley and Greenlee of this decision. The back-up team from Hazard was instructed to enter the mine and relieve the Martin team.

The Hazard team entered the mine at 6:10 p.m. and traveled to the intersection of the east main and south main entries where they met and conferred with the Martin team. After they had discussed the area that had been explored and the conditions encountered, the Martin team returned to the surface and the Hazard team began exploring the mine in the direction of the south main working section. The Hazard team encountered evidence of the explosion at the No. 16 crosscut. At this location, they observed scorched rock dust bags.

While the Hazard team was traveling to the No. 22 crosscut, the State team from Pikeville entered the mine at 7:12 p.m., and Stanley and Greenlee entered the mine at 7:35 p.m. A fresh-air base was established at the No. 22 crosscut.

The Hazard team found traces of carbon monoxide and flammable gases at the No. 23 crosscut in the Nos. 3 and 4 entries. The Hazard team retreated to the fresh-air base, and the Pikeville team was instructed to explore, under oxygen, the Nos. 5 and 6 entries and the face area.

The evidence of the explosion became more pronounced as the Pikeville team traveled toward the face area. The stoppings separating the intake aircourses from the belt entry were blown out or partially blown out beyond the No. 22 crosscut, short circuiting the ventilation. The Pikeville team did not encounter any gases until they reached the No. 33 crosscut. At that location, a trace of carbon monoxide was detected. At 8:39 p.m., the team found the body of David Slone at the left outby corner of the last open crosscut in the No. 5 entry. They detected 1.1 percent of flammable gases near this body and 1.4 percent in the face of No. 6 entry. Continuing across the last open crosscut, they found the body of Tommy Centers at the inby right corner of the crosscut in the No. 3 entry. The body of Clarence Perry was located on the left rib in the crosscut between the Nos. 2 and 3 entries. The bodies of Roy Perry and Bobby Slone, the fourth and fifth to be found, were located just outby the crosscut in the No. 3 entry.

Upon finding these bodies, the team returned to the fresh-air base, and briefed Stanley and Greenlee as to the conditions encountered and the locations of the bodies. Stanley, Greenlee and the Pikeville team then returned to the surface. On the way out of the mine, they met the second team from Martin traveling into the mine. The second Martin team had entered the mine at 8:45 p.m. and had been instructed to establish a communication system so that the recovery teams could maintain contact with the surface. When Greenlee reached the surface at 9:25 p.m., he informed Spicer of the conditions that had been encountered and that 5 bodies had been found. Brattice material was obtained and transported to the fresh-air base. Howard and Allen entered the mine with this material. The rescue teams and others present began erecting temporary stoppings in the crosscuts between Nos. 4 and 5 entries to replace the permanent stoppings that had been blown out by the forces of the explosion.

Once the temporary stoppings had been installed, the exploring of the Nos. 3 and 4 entries and the face area began anew. The bodies of James Gibson and Dillard Ashley were found near the section loading point, Ashley in the crosscut between the Nos. 3 and 4 entries and Gibson in No. 4 entry at the inby corner of the right crosscut. When these 2 bodies were found, all of the miners were accounted for except one. When the teams reached the last open crosscut, they encountered carbon monoxide in Nos. 5 and 6 entries. The teams installed a line curtain in No. 6 entry and cleared it of harmful gases. Due to the amount of carbon monoxide, 1,000 ppm, detected in the No. 5 entry, they decided to build a temporary seal just inby the corner of the last open crosscut to prevent the gases from escaping until they could explore the rest of the section. A line curtain was installed in No. 4 entry, and once the gases were cleared, the rest of the section was explored without detecting any flammable gases, smoke or carbon monoxide.

The eighth body, that of Keith Crager, was found about 12:45 a.m. on December 8, 1981, partially under the section shot firer's cart at the inby corner of the last open crosscut in No. 2 entry. When all of the bodies had been located, some of the rescue teams' members traveled to the surface while other team members remained underground. Greenlee, Hargis Ison, Coal Mine Inspection Supervisor and Jeff Ison, Jr., went underground and assisted in the recovery of the bodies. The bodies were transported to the surface, arriving about 2:25 a.m., and all personnel had been withdrawn from the mine by 3 a.m. The victims' names, locations where they were found, the locations of the electric face equipment and other information revealed during the recovery and investigation are shown on the maps in Appendices K and L.

On December 8, 1981, autopsies were performed on all the victims by Dr. George R. Nichols II at the Hazard Regional Appalachian Hospital, Hazard, Kentucky. According to the autopsy reports, all 8 victims died from carbon monoxide poisoning that resulted from smoke inhalation.

The self-rescuers of all the victims, except Roy Perry, were found either on their belts or near their bodies. A self-rescuer, which probably belonged to Perry, was found with the top off near the body of Tommy Centers. The investigators concluded that it was blown to that location by the forces of the explosion.

PART III

INVESTIGATION, DISCUSSION, AND EVALUATION

Organization and Interviews

On December 8, 1981, MSHA selected and organized an investigation team and developed detailed plans and procedures for investigating the explosion. On December 9, 1981, part of the investigating team entered the mine and began a comprehensive investigation and evaluation of the existing conditions in the affected areas of the mine. All observed conditions were recorded by the team members either on a map or in notebooks. Maps showing detailed information gathered in the area affected by the explosion are contained in Appendices K and L. Mine dust surveys were made according to standard MSHA procedures for making these surveys from the mine drift openings to near the faces in all the active entries and other areas where coal dust could have contributed to the explosion. Where necessary, photographs were taken and sketches made of conditions, equipment and articles. The underground investigation continued until December 18, 1981.

In conjunction with the underground portion of the investigation, interviews of the mine officials, mine rescue and recovery personnel, miners, and MSHA personnel who could furnish information pertinent to the events occurring before and after the explosion were conducted by members of the investigation team.

On December 15 and 16, 1981, a meeting was held at the Kentucky Department of Mines and Minerals office in Martin, Kentucky. MSHA investigators, State and United Mine Workers of America officials questioned 19 officials and employees of Adkins Coal Company, a State mine inspector, a safety training instructor employed by Industrial Education Corporation and a previous employee of Adkins Coal Company. The names of the persons interviewed are in Appendix C.

Persons Who Participated in the Investigation

The underground investigation of the explosion began on December 9 and continued until December 18, 1981. The following persons participated in the investigation:

Adkins Coal Company

Orville Adkins	President/Partner
Adam Adkins	Vice President/Partner
Harold Baldridge	Superintendent
Morton Conley	Assistant Superintendent
Taylor L. Prater	Repairman
John Bates	Foreman
Robert Smith	Office Manager
Robert Cusick	Attorney Representing the Company

United Mine Workers of America

Sam Church	President
Joe Taylor	Safety Director
Eldon Callen	Director, Office of Public Information
James Boyd	Safety Division
Leonard Fleming	Safety Division
William Willis	Safety Division
Denny Swigart	Safety Division
J. B. Trout	District 30 International Executive Board Member
Ernie Justice	District 30 President

Kentucky Department of Mines and Minerals

Willard Stanley	Commissioner
Bill Reed	Supervisor (Analyst)
Archie Justice	Mining Instructor
Larry Sexton	Analyst
Bobby Sexton	Inspector
Clarence Kidd	Analyst
Raymond Kidd	Inspector
Azzie Hall	Inspector
Vaughn Watson	Analyst
David Martin	Analyst
Curtis Miller	Inspector
Richard Watts	Inspector
Benny Combs	Analyst
Charles Johnson	Analyst
Ballard Little	Analyst

Old Republic Insurance Company

Thomas Nelson	Lost Control Representative
Lowell Akers	Lost Control Representative

Island Creek Coal Company

Charles Leonard	Safety Engineer
Carl Smith	Division Safety Director

Mine Safety and Health Administration

J. L. Spicer	District Manager, District 7
Richard Garcia	Mining Engineer
Henry Standafer	Supervisory Technical Specialist (Electrical)
Kenneth Dixon	Supervisory Technical Specialist (Ventilation)
Kenneth Howard	Coal Mine Inspection Supervisor (Special Investigations)

Edward Morgan	Coal Mine Inspector
John Pyles	Geologist
Jeff Ison, Jr.	Coal Mine Inspector
Dwight Greenlee	Subdistrict Manager, Hazard
Clarence Ritchie	Coal Mine Inspector
Stanley Allen, Jr.	Coal Mine Inspector
Willis Tolliver	Coal Mine Inspector
Arvil Burnette	Coal Mine Inspector (Electrical)
Richard Moffitt	Industrial Hygienist
Albert McFarland	Mine Safety and Health Specialist
Roy Parker	Coal Mine Inspector
Ronald Honeycutt	Coal Mine Inspector
Ronald Suttles	Coal Mine Inspector
Ray Williams	Coal Mine Inspector
Lester Banks	Coal Mine Inspector
Paul Watson	Coal Mine Inspector
Clete Stephan	Mining Engineer, Technical Support
Claude Reich	Mine Safety and Health Specialist, Technical Support
Alan Yamamoto	Attorney, Office of the Solicitor
Robert Elam	Mining Engineer
Charles Luxmore	Mine Safety and Health Specialist

Factors Affecting the Explosion

Explosives

Reportedly, the day shift drill crew drilled the right crosscut in the No. 1 entry. Due to a malfunction of the drill, they did not drill the face of No. 1 entry. The drill crew removed the trailing cable from the drill and installed it on the extra drill that was present on the section. They did not, however, have time to complete the splicing of the cable before the end of the shift.

At the start of the second shift, 25 cases of explosives were transported from the surface to the 007 section. Apparently, 2 cases of explosives were placed in the small rubber-tired shot firer's cart, 2 were used to charge the faces of No. 1 entry and the right crosscut, and 14 cases were stored on the mine floor in the last open crosscut and in the working places inby the crosscut. Of the unopened 14 cases, 3 were stored on the mine floor in each of the Nos. 2, 3 and 4 entries, 3 cases in the last open crosscut between Nos. 5 and 6 entries, and 2 cases in No. 6 entry. It was the consensus of the investigators that the remaining 7 cases were placed on the mine floor near the section storage magazine. During the investigation, miners stated that this was a common practice on the 2 p.m. to 10 p.m. second shift. Two explosives storage magazines were located outby the face in a crosscut between Nos. 1 and 2 entries. This is a violation because the explosives stored in the working places were not located out of the line of blast and 50 feet or more from the working face and 15 feet from powerlines.

Evidence was presented during the interviews of the miners which established that it was a common practice to transport explosives in the original paper cartons into the working sections in the bare metal bucket of a scoop tractor and then distribute one or more of the cartons to each working face. It was determined that the transportation and the storage practices were not a factor in the explosion except they indicated poor practices in the use and handling of explosives.

In preparing the places to be blasted, 7 to 9 blast holes were drilled, about 30 inches apart, ranging in depth from 4 to 10 feet, in both the entries and crosscuts. During the investigation, it was revealed that approximately 50 pounds of explosives were used in each face. Using a case in each face would require each hole to be charged with 6 to 8 cartridges of explosives. Each cartridge of the explosive weighed about 0.86 pound and the 50-pound cartons contained about 58 cartridges.

Miners employed at the mine stated that the paper wrappings of the cartridges of explosives were slit before inserting them into the blast holes and the deformed cartridges were tamped into the holes and detonated without stemming. Blast holes 4 feet or more in depth are required to be tamped with at least 24 inches of incombustible stemming material. The investigators observed a blast hole in the face of No. 1 entry which had not completely detonated. The undetonated explosives were removed from this hole by the investigators; the hole measured 74 inches in depth and was charged to the collar. There was no evidence of a blasting cap or stemming in the hole. Because the mine used cartridges 12 inches in length, the blast hole contained at least 6 cartridges of explosives which would weigh approximately 5 pounds. The regulations contained in Title 30, Code of Federal Regulations, place a 3-pound limit on the amount of explosives that may be used in boreholes for the blasting of coal.

Apparently, the second shift drill crew drilled the face of the No. 1 entry and the shot firer prepared the right crosscut and the face for blasting prior to the explosion. Once the places were charged for blasting, the evidence indicated that 5 of the victims were positioned in the last open crosscut prior to initiating the blast of the 2 faces. The 2 faces were shot simultaneously and the coal dust thrown into suspension by the blast was ignited by a blown-out shot in the face of No. 1 entry, causing the explosion.

After the explosion, the investigators found the blasting cable loosely twisted and coiled around a tamping stick in the intersection of No. 2 entry and the last open crosscut. The permissible 20-shot blasting unit was found in the intersection of the No. 3 entry and the last open crosscut. Also, about 100 electric blasting caps and about 2 cases of explosives were scattered on the mine floor in the last open crosscut from the No. 1 entry to the No. 6 entry. The investigators believe the undetonated blasting caps and loose explosives came from the section shot firer's cart that was overturned by the forces of the explosion.

Samples from the same lot of explosives scattered on the mine floor and from an unopened case were tested by the Bureau of Mines and found to be within the required tolerances for permissible explosives.

Methane and Ventilation

During the last inspection made of the mine during October 1981, air samples were collected and sent to the MSHA Mt. Hope, West Virginia, Laboratory. The analyses of these samples indicated that the samples collected in the immediate section return aircourses and in the main return aircourses did not contain methane. During the recovery operations, 14 air samples were collected in the main return at the mine fan. The laboratory analyses of these samples determined that the methane content ranged from 0.01 to 0.03 percent. These samples were collected at about 30-minute intervals from 6:30 p.m. on December 7 to 12:45 a.m. on December 8, 1981. The analyses of the air samples collected during the recovery operations are in Appendix G.

The mine rescue team members and others involved in the recovery made numerous tests for methane with handheld detectors; these instruments indicated readings up to 1.4 percent of combustible gases. However, the laboratory analyses determined that these readings were not methane, but were predominately other hydrocarbon gases that resulted from the explosion. The company's mine records of preshift, on-shift and weekly examinations indicated that this mine did not liberate methane. For these reasons, methane was not considered a factor in the explosion.

During the investigation, line brattice materials were not found in the mine. This indicated that line brattices were not being used to direct the ventilation currents into the working places. The report of the preshift examination made on the shift before the explosion indicated that 15,500 cfm of air was measured in the immediate section return aircourse. The quantity of air being circulated through the mine was adequate and was not considered a factor in the explosion. However, failure to install ventilation controls to direct the ventilating air currents into the face area of the No. 1 entry was a factor in the explosion. Properly installed and adequately maintained line brattice would have directed ventilation to the face and removed the coal dust which was dispersed into suspension when the coal was blasted.

Coal Dust

During the investigation, MSHA conducted a mine dust survey of the mine. Band samples were taken in the east main and south main entries, in the rooms developed to the right and in the entries developed to the left off the south main entries. A total of 145 samples were taken 100 feet apart in the immediate explosion area and 200 feet apart elsewhere in the areas described above, except in the areas that were too wet to be sampled. The samples were analyzed for incombustible content, percent of float dust and the presence of coke. The laboratory analyses of 28 of the 41 samples collected outby the immediate explosion area and 102 of the 104 samples collected in the explosion area were below the minimum percentages of incombustible content for the intake and return aircourses. The average float dust content of the 145 samples was 19.1 percent. All of the mine dust samples were tested for coke using the alcohol coke test. Of 108 samples collected inby the No. 23 crosscut, the analyses showed 106 contained coke. Coke was also present in 13 of 37 samples collected outby the No. 23 crosscut. A map showing the location of all the mine dust samples and a report of the analyses of the samples are in Appendices I and H.

The following conditions or practices contributed to the severity and propagation of the explosion:

Evidence indicated that in the working places, particularly in distances less than 40 feet from the face, water, with or without a wetting agent, or other no less effective methods was not applied to coal dust on the ribs, roof and floor to reduce dispersibility and to minimize the explosion hazard.

Coal dust, including float coal dust, and accumulations of coal ranging in depth from 1 to 4 inches had accumulated in the 007 section. The coal dust, including float coal dust, was deposited in Nos. 1 and 2 entries from the last open crosscut to the section loading point and in the entries driven to the left off the south main. Loose coal and coal dust, including float coal dust, from 1 to 4 inches in depth had accumulated at numerous locations on the scoop haul roads from the section loading point to the last open crosscut, a distance of approximately 200 feet.

The Explosion and Propagation

The evidence indicated that the accident occurred while the face and right crosscut were being blasted simultaneously from the solid in the No. 1 entry of the active working section. The investigation revealed that a train of explosives, at least 74 inches in length, in the second hole from the right rib of the No. 1 entry face failed to detonate. This failure provided too much burden for the rib hole to pull, causing the rib hole to blow out and ignite the coal dust which was in suspension from the blast of the other holes and the coal dust in suspension which had been previously deposited on the floor, roof and ribs from earlier mining operations.

Flame and major forces of the explosion traveled out the No. 1 entry and across the last open crosscut and then out all 6 entries. When the flame and forces reached the entries developed to the left off the No. 1 entry, the evidence indicated that they traveled into the left side of these entries until they reached the face. The flame and forces then traveled out the right side of these entries back to the south main entries. The explosion developed enough pressure and velocity to damage the stoppings 12 crosscuts, or 700 feet, outby the face of the south main on the intake and return side, except the stoppings in the Nos. 27 and 28 crosscuts on the return side which remained intact. From 1 to 3 blocks were out of the stoppings in the Nos. 20, 21, and 22 crosscuts on the return side. Other forces also traveled outby in the south main entries and damaged a concrete block stopping at the intersection of the east main and south main entries. Debris blown by the explosion forces damaged a jeep automobile parked on the surface near the drift openings.

Generally, the incombustible content of mine dust samples collected by the investigation team more than 750 feet outby the faces contained a higher incombustible content than the samples collected inby this point. Water had accumulated in various locations on the mine floor in the Nos. 1 and 2 entries. The investigators concluded that the combination of the above factors and the splitting of the flame and forces when they

reached the entries driven to the left off the south main contributed to a reduced pressure wave and a decrease in air velocity, which limited the propagation of the explosion.

Flame and Forces

The extent of the flame and direction of the forces of the explosion has been determined from the underground observations of the investigation team and from the amount of coke present in the analyses of the mine dust samples.

Flame

Evidence of heat or flame in the form of soot in the entries or coke in the mine dust samples was present in all 6 south main entries. Soot and coke were found in significant quantities in the No. 1 entry for a distance of 680 feet outby the face and in the No. 6 entry from just inby the last open crosscut for a distance outby of 325 feet. Samples obtained during the investigation revealed that the areas where the most severe coking occurred were in and near the last open crosscut, the area of the section loading point, the area outby the loading point in the Nos. 1, 2 and 3 entries, and in the entries that had been developed left off the south main. The entries to the left had been developed a distance of about 700 feet, and the analyses of the samples obtained in these entries indicated the coking was the most pronounced in this area; of the 41 samples analyzed, 32 revealed large or extra large amounts of coke.

Samples of clothing, safety hats, lunch buckets, and other articles present in the explosion area were tested to determine the melting point of each. The tests indicated that a temperature of at least 553 degrees Fahrenheit existed in the last open crosscut. There was some evidence of flame, such as scraps of scorched paper from rock dust bags, found 700 feet from the face in the No. 1 return aircourse and 1,100 feet outby the face in the No. 5 intake aircourse. It is the opinion of the investigators that this material was carried outby the flame area by the forces generated by the explosion. A mine map depicting the extent of flame is provided in Appendix J.

Forces

The extent of forces developed by the explosion was determined by the sweeping effect of the mine floor in the last open crosscut, the coal dust blown against objects in the immediate explosion area, particularly the last open crosscut, and the physical damage to the ventilation controls, to the section power center, to a water tank mounted on a skid and to a jeep automobile parked on the surface in front of the intake air drift opening.

The stoppings and curtains installed in the entries developed to the left off the south main, about 120 feet outby the faces of the active working section, were blown out or damaged. Ten concrete block stoppings separating the Nos. 5 and 6 intake air courses from the No. 3

conveyor belt entry were blown out or partially blown out from the third crosscut to the twelfth crosscut outby the face. The concrete block stoppings separating the Nos. 1 and 2 return air courses from the Nos. 3 and 4 entries were also blown out or damaged to the extent that they were ineffective, except for the stoppings in the Nos. 27 and 28 crosscuts which remained intact. The stopping across the No. 4 entry at the east main conveyor belt tailpiece was partially blown out.

The distance the forces traveled from the face to the surface was about 2,350 feet. A jeep automobile was parked on the surface near the drift openings. Debris struck the front of the jeep, damaging the radiator and breaking the glass lens of the headlights. An old bus once used for storage of mine supplies was parked about 200 feet from the intake air drift opening. The bus was struck by mud, water and debris emitting from the intake air drift opening.

Point of Origin

It was the consensus of the investigators that the evidence established the point of origin of the explosion as the face of the No. 1 entry in the south main working section.

PART IV
FINDINGS OF FACT

Findings

1. The volatile ratio of the coal in the face area of the No. 1 entry of the 007 section from an analysis of a standard channel sample of coal was 0.39, indicating the coal dust at this mine was highly explosive.
2. A total of 145 mine dust samples were collected during the investigation. Approximately 88.5 percent (130) of the samples contained less than the required incombustible content. The laboratory analyses of these samples determined that 28 of the 41 samples collected outby the explosion area were below the minimum required percentages for incombustible content. The analyses of the samples from the explosion area revealed that 102 of 104 were also deficient in incombustible content.
3. The samples were also screened to determine the amount of float dust contained in the samples. The average float dust content in these samples was 19.1 percent.
4. Evidence indicated that in the working places, particularly in distances less than 40 feet from the face, water, or other no less effective methods, was not applied to coal dust on the ribs, roof and floor to reduce dispersibility and to minimize the explosion hazard.
5. Coal dust, including float coal dust, was deposited in Nos. 1 and 2 entries from the last open crosscut to the section loading point and in the entries developed to the left off the south main. Loose coal and coal dust, including float coal dust, from 1 to 4 inches in depth had accumulated at numerous locations on the scoop haul roads from the section loading point to the last open crosscut.
6. The coal was blasted from the solid faces by a method commonly called "slab shooting," and 7 to 9 boreholes were used for shooting each face.
7. The type of explosives used was Permissible E, a granular-based permissible explosive, in 1-1/2- by 12-inch cartridges. Each cartridge weighed approximately 0.86 pound. The original paper cartons each contained 50 pounds, with about 58 cartridges in each carton.
8. The second shift crew entered the mine on Monday, December 7, 1981, at 2 p.m., and was transported by scoop to the south main active working section, a distance of about 2,300 feet from the surface. The crew members arrived on the section about 2:15 p.m. and began

their assigned duties. The drill crew drilled the face of No. 1 entry and the shot firer charged the blast holes in the crosscut right and the No. 1 entry face.

9. At approximately 2:50 p.m., a coal dust explosion occurred on the south main working section. The accident resulted in the death of all 8 miners who were underground at the time. Prior to the explosion, a scoop operator left the working section and traveled to the surface because of a mechanical problem on the scoop. This scoop operator was not injured and observed the effects of the explosion as it reached the surface.
10. The evidence indicated that the accident occurred when the face and right crosscut were blasted simultaneously from the solid in the No. 1 entry of the active working section. The investigation revealed that a train of explosives, at least 74 inches in length, in the second hole from the right rib of the No. 1 entry face failed to detonate. This failure provided too much burden for the rib hole to pull, causing it to blow out, igniting the coal dust which was in suspension from the blast of the other holes and the dust in suspension which had been previously deposited on the floor, roof and ribs from earlier mining operations.
11. The misfired blast hole in the face of the No. 1 entry was 74 inches in depth and contained a continuous train of undetonated explosives. This blast hole contained at least 6 cartridges of explosives which weighed approximately 5 pounds. This was in excess of the 3-pound per hole limitation. The investigators found no evidence of stemming or a blasting cap in this hole.
12. Miners employed at the mine stated that boreholes ranging in depth from 4 to 10 feet were charged with about 6 pounds of permissible explosives and detonated without stemming. The paper wrapping that contained the explosive cartridges was deliberately deformed by slitting with a razor blade so that it could be compacted in the holes. It was a practice to use a 50-pound case of explosives to blast each face.
13. Explosives and detonators for use in the 007 working places were not located out of the line of blast and 50 or more feet from the working face and 15 feet from powerlines. Eleven cases of explosives in their original containers were stored within 40 feet or less of the faces in the Nos. 2, 3, 4 and 6 entries.
14. Explosives in their original paper shipping containers were transported from the surface to the working section in the exposed metal bucket of a battery-powered scoop and distributed to the working places.
15. Samples were obtained of the same lot of explosives scattered on the mine floor and from an unopened case of the explosives in the mine. When tested by the Bureau of Mines, the explosives were found to be within the required tolerances for permissible explosives.
16. Mine ventilation was induced by a 6-foot propeller-type fan operated exhausting. During the last inspection of the entire mine conducted

October 7-22, 1981, approximately 15,642 cfm of air was measured in the intake entries at the last permanent stopping. Approximately 9,020 cfm of air was measured in the immediate return of the working section and 76,400 cfm of air was measured in the main return at the mine fan. The analyses of air samples taken at the locations where the air measurements were made did not reveal any methane in the mine.

17. During the investigation, line brattice materials were not found in the mine. Line brattices were not being used to direct the ventilation currents into the working places. The quantity of air being circulated through the mine was adequate and was not considered a factor in the explosion. However, failure to install ventilation controls to direct the ventilating air currents into the face area of the No. 1 entry was a factor in the explosion. Properly installed and adequately maintained line brattice would have directed ventilation to the face and removed the coal dust which was dispersed into suspension when the coal was blasted.
18. The analyses of air samples collected prior to and during the investigation, the methane detector tests made during the recovery and on prior inspections, and the reports of the preshift and on-shift examiner establishes that methane was not a factor in the explosion.
19. The operator had a contract with the Industrial Education Corporation of Pikeville, Kentucky, to train the employees at this mine. Refresher training was provided for the employees on November 6 and 11, 1981. During this training, the miners were instructed in the safe use and handling of explosives.
20. Records indicate that the day shift (6 a.m. to 2 p.m.) mine foreman made a preshift examination of the working section and reported no unsafe conditions.
21. Evidence of heat or flame in the form of soot in the entries or coke in the mine dust samples was present in all 6 south main entries. Soot and coke were found in significant quantities in the No. 1 entry a distance of 680 feet outby the face and in the No. 6 entry from just inby the last open crosscut for a distance outby of 325 feet. Samples obtained during the investigation revealed that the areas where the most severe coking occurred was in and near the last open crosscut, in the area of the section loading point, in the area outby the loading point in the Nos. 1, 2 and 3 entries and in the entries that had been developed left off the south main. The entries to the left had been developed a distance of about 700 feet and the analyses of the samples obtained in these entries indicated the coking was the most pronounced in this area; of the 41 samples analyzed, 32 revealed large or extra large amounts of coke.
22. Samples of clothing, safety hats, lunch buckets and other articles present in the explosion area were tested to determine the melting point of each. The tests indicated that a temperature of at least 553 degrees Fahrenheit existed in the last open crosscut.

23. The analyses of the 145 mine dust samples collected during the investigation determined that coke was present in 119, which is 82 percent, of the samples.
24. The major forces of the explosion traveled out the south main No. 1 entry, across the last open crosscut and then out all 6 entries. When the flame and forces reached the entries developed to the left off the No. 1 entry, they traveled into the left side of these entries until they reached the face. The flame and forces then traveled out the right side of these entries back to the south main entries. The explosion developed enough pressure and velocity to damage the stoppings 12 crosscuts, or 700-feet, outby the face of the south main on the intake and return side, except the stoppings in the Nos. 27 and 28 crosscuts on the return side which remained intact. From 2 to 3 blocks were out of the stoppings in the Nos. 20, 21 and 22 crosscuts on the return side. Forces also traveled outby in the south main entries and damaged a concrete block stopping at the intersection of the east main and south main entries. Debris blown by the explosion forces damaged a jeep automobile parked on the surface near the drift openings.
25. Generally, the incombustible content of mine dust samples collected by the investigation team more than 750 feet outby the face contained a higher incombustible content than the samples collected inby this point. Water had accumulated at various locations in the Nos. 1 and 2 entries. The investigators concluded that the combination of the above factors and the splitting of the flame and forces when they reached the entries driven to the left off the south main contributed to a reduced pressure wave and a decrease in air velocity which limited the propagation of the explosion.
26. The first mine rescue team entered the mine at 4:55 p.m. on December 7, 1981. The mine rescue and recovery teams explored and ventilated the explosion area of the mine, locating the last victim at 12:45 a.m. on December 8, 1981. The bodies were transported to the surface at 2:25 a.m. and all personnel were withdrawn from the mine at 3 a.m. on December 8, 1981.
27. The mine rescue teams detected a maximum of 1,000 ppm carbon monoxide and 1.4 percent of combustible gas during the recovery operations. The laboratory analyses of samples taken at the mine fan during the recovery showed a maximum of 1,000 ppm carbon monoxide and 0.03 percent of methane.
28. According to the autopsy reports, all 8 victims died from carbon monoxide poisoning that resulted from smoke inhalation.
29. The self-rescuers of all the victims, except Roy Perry, were found either on their belts or near their bodies. A self-rescuer, which probably belonged to Perry, was found with the top off near the body of Tommy Centers. The investigators concluded that it was blown to that location by the forces of the explosion.
30. The electric equipment and circuits underground were examined and/or tested during the investigation. There were violations pertaining

to the electric equipment and circuits. However, the results of the tests and examinations established that the electric equipment and circuits were not factors in the explosion.

31. During the investigation, smoking articles were found in jacket pockets and in lunch buckets of several of the victims. There were several loose cigarettes, 1 empty cigarette package and cigarette butts found in the last open crosscut from the No. 2 entry to the No. 5 entry. The pathologist's report states that 2 victims had smoking materials in their clothing pockets. It was apparent that smoking was a practice underground. However, smoking was not considered a factor in the explosion.

Contributing Violations

Eight of the conditions and/or practices discussed in the "Findings of Fact," contributed to the explosion or were indictative of the blasting and explosive handling practices followed at the mine and constituted violations of the Federal Mine Safety and Health Act of 1977 and the mandatory standards contained in Title 30, Code of Federal Regulations. These are listed below:

- Section 75.316 - Properly installed and adequately maintained line brattice or other approved devices were not continuously used from the last open crosscut to within 10 feet of the faces of Nos. 1, 2 and 5 entries to provide adequate ventilation to the working faces for the miners and to remove flammable, explosive, and noxious gases, dust and explosive fumes. Line brattice or other approved devices was not available on the working section.
- Section 75.400 - Coal dust, including float coal dust, and accumulations of coal ranging in depth from 1 to 4 inches had accumulated in the 007 section. The coal dust, including float coal dust, was deposited in Nos. 1 and 2 entries from the last open crosscut to the section loading point and in the entries driven to the left off the south main. Loose coal and coal dust, including float coal dust, from 1 to 4 inches in depth had accumulated at numerous locations on the scoop haul roads from the section loading point to the last open crosscut, a distance of approximately 200 feet.
- Section 75.401 - Evidence indicated that in the working places, particularly in distances less than 40 feet from the face, water, with or without a wetting agent, or other no less effective methods approved by the Secretary, was not applied to coal dust on the ribs, roof and floor to reduce dispersibility and to minimize the explosion hazard.

- Section 75.403 - Mine dust samples were collected on the 007 section south main headings, the first set of worked-out rooms developed right off the south main, and the east main entries from the surface to where they intersected the south main entries. The laboratory analyses of the samples collected in the intake and return aircourses outby the immediate explosion area determined that the incombustible content of 28 out of 41 samples were below the minimum required percentages for incombustible content.
- Section 75.1303 - A blast hole 74 inches in depth contained a continuous train of undetonated explosives without a blasting cap. The explosive in use at the mine was manufactured in sticks that were 12 inches long and 1-1/2 inches in diameter; each stick weighed approximately 0.86 pound. The blast hole contained at least 6 sticks which weighed approximately 5 pounds.
- Section 75.1303 - Boreholes ranging in depth from 4 to 10 feet were charged with about 6 pounds of permissible explosives and detonated without stemming. The paper wrapping that contained the explosive was deliberately deformed by slitting with a razor blade so that it could be compacted in the holes.
- Section 75.1305 - Explosives in their original paper shipping containers were transported from the surface to the working section in the exposed metal bucket of a battery-powered scoop.
- Section 75.1307 - Explosives and detonators for use in the 007 working places were not located out of the line of blast and 50 feet or more from the working face and 15 feet from powerlines. Eleven cases of explosives in their original containers were stored in the working places in No. 2, 3, 4 and 6 entries.

A copy of the citation and orders are in Appendix F. Other violations were found during the investigation which did not contribute either to the cause or severity of the explosion. Appropriate citations were issued to Adkins Coal Company for all violations revealed.

PART V

CONCLUSION

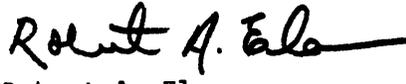
The investigators concluded that a coal dust explosion occurred when a blown-out shot from the right corner blast hole of the No. 1 entry face on the south main section ignited coal dust which had been put into suspension by the blasts of this face and the face of the right crosscut. The coal dust deposited on the floor, roof and ribs from previous mining operations was also placed into suspension by the blasts, ignited and contributed to the propagation of the explosion. The blown-out shot occurred in the last hole in the sequence of shots which were initiated by delayed electric blasting caps having a nominal delay time of 25 to 700 milliseconds. The blown-out shot was caused when the second hole from the corner failed to completely detonate leaving the corner hole overburdened. The remainder of the partially failed hole, 74 inches in depth, contained a continuous train of undetonated explosives without a blasting cap or stemming.

The following conditions and practices contributed to the cause of the explosion and its propagation:

1. The investigation revealed that each blast hole was charged with about 6 pounds of explosives and it was a practice to use a 50-pound case to blast each face;
2. Miners employed at the mine stated that the paper wrappings around the cartridges of explosives were slit before inserting the cartridges into the blast holes and that the deformed cartridges were tamped into the hole and blasted without stemming;
3. Water, with or without a wetting agent, or other no less effective methods, was not applied to coal dust on the ribs, roof and floor, particularly in distances less than 40 feet from the face, to reduce dispersibility and to minimize the explosion hazard;
4. Sufficient quantities of rock dust were not applied to the mine surfaces to render the coal dust inert to prevent the explosion from propagating;
5. Coal dust, including float coal dust, and loose coal was permitted to accumulate along the entries in the working section in the areas immediately outby and in the entries developed to the left of the section loading point; and,
6. Line brattices, or other approved devices were not installed and maintained in the working places to remove the coal dust that was dispersed into suspension when coal was being blasted from the solid in the faces of the entries and connecting crosscuts.

Respectfully submitted,


Charles E. Luxmore
Mine Safety and Health Specialist


Robert A. Elam
Mining Engineer

Approved by:




Joseph A. Lamonica
Administrator
for Coal Mine Safety and Health

APPENDIX A

Victims of Explosion
 No. 11 Mine
 ID No. 15-02290
 Adkins Coal Company
 December 7, 1981

<u>Name and Social Security Number</u>	<u>Age</u>	<u>Sex</u>	<u>Job Classification</u>	<u>Experience at job</u>	<u>Total Mining Experience</u>
Bobby Slone 406-58-7073	39	Male	Section Foreman	1 month	19 years
Roy Perry 300-52-3049	22	Male	Coal Drill Operator	1 yr. 3 mos.	1 yr. 3 mos.
Keith Crager 406-82-4586	25	Male	Shot Firer	1 yr. 4 mos.	7 years
Clarence Perry 274-54-7900	28	Male	Coal Drill Operator	1 yr. 4 mos.	6 years
James E. Gibson 406-90-1691	24	Male	Scoop Operator	5 mos.	6 years
Tommy Centers 406-70-9416	31	Male	Roof-Bolting Machine Operator	4 1/2 mos.	16 years
Dillard Ashley 401-62-5408	40	Male	General Laborer	10 mos.	11 years
David Slone 287-54-1526	25	Male	Scoop Tractor Operator	2 1/2 mos.	4 1/2 years

APPENDIX B

Mine Rescue Teams used during recovery operations following mine explosion at Adkins Coal Company's No. 11 Mine on December 7, 1981

Martin Team

Larry Sexton - Captain
Bobby Sexton
Curtis Miller
Eddie Akers
David Martin
Eugene Lewis

Pikeville Team

David Phillips - Captain
Elihu Coyer
Don Lawson
Don Wallen
Charles Hackney
Kenneth Kelly

Hazard Team

Bill Cantrell - Captain
Doug Moncrief
Darrell Wooten
Roger Reynolds
Alexander Johnson
Manuel Stone

Martin Team

Benny Combs - Captain
Vaughn Watson
Clarence Kidd
Richard Watts
Pleas Causey
Elam Hall

Persons who participated in the recovery operations are as follows:

Adkins Coal Company

Orville Adkins	President
Adam Adkins	Vice President
Harold Baldrige	Superintendent
Morton Conley	Assistant Superintendent
John Bates	Mine Foreman
Ben Johnson	Employee
Charles Conley	Scoop Operator
Elam Hall	Employee

Island Creek Coal Company

Clive D. Case	Mining Engineer
---------------	-----------------

Kentucky Department of Mines and Minerals

Willard Stanley	Commissioner
Billy Reed	District Supervisor
Ballard Little	Safety Analyst
Elmo Green	Inspector

APPENDIX C

List of persons interviewed during the investigation.

Adkins Coal Company

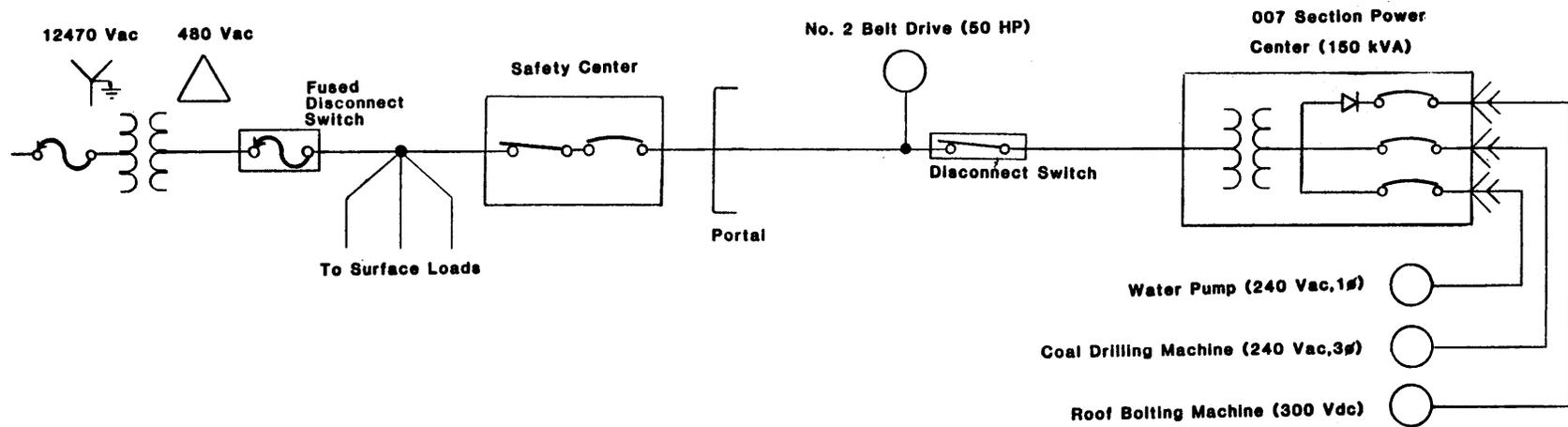
Orville Adkins	President
Adam Adkins	Vice President
Harold Baldrige	Superintendent
John L. Bates	Mine Foreman
Ellis Sexton	Shot Firer
Donald Perkins	Scoop Operator
Herman Fouts	Scoop Operator
Buddy Hall	Drill Operator
Jerry Lawson	Drill Operator Helper
Adam Ousley	Clean-up Man
Charles Conley	Scoop Operator
Carlton Conley	Conveyor Belt Man
Roger D. Adams	Clean-up Man
Lester Bentley	Roof Bolter Operator
Roy Conley	Scoop Operator
Weddler H. Hicks	Clean-up Man
Grayson Slone	Clean-up Man
Larry Bentley	Repairman

Other

Nando Mullins	Safety Instructor (Industrial Education Corp.)
Lester Lawson	Former employee of Adkins Coal Company
Larry Sexton	Safety Analyst, Kentucky Department of Mines and Minerals
Robert G. Smith	Salesman and Credit Manager, S & H Manufacturing, Inc.

Mine Safety and Health Administration

Jerry L. Spicer	District Manager, District 7
Lawrence D. Phillips	District Manager, District 6
Dwight Greenlee	Subdistrict Manager, Hazard, KY
Kenneth Howard	Coal Mine Inspection Supervisor
J. Hargis Ison	Coal Mine Inspection Supervisor
Kenneth Dixon	Coal Mine Inspection Supervisor
Edward Morgan	Coal Mine Inspector (Special Investigation)
Jeff Ison, Jr.	Coal Mine Inspector
Stanley Allen, Jr.	Coal Mine Inspector
Clarence Ritchie	Coal Mine Inspector
Delbert Crum	Safety Specialist (Instructor)
Willis Tolliver	Coal Mine Inspector



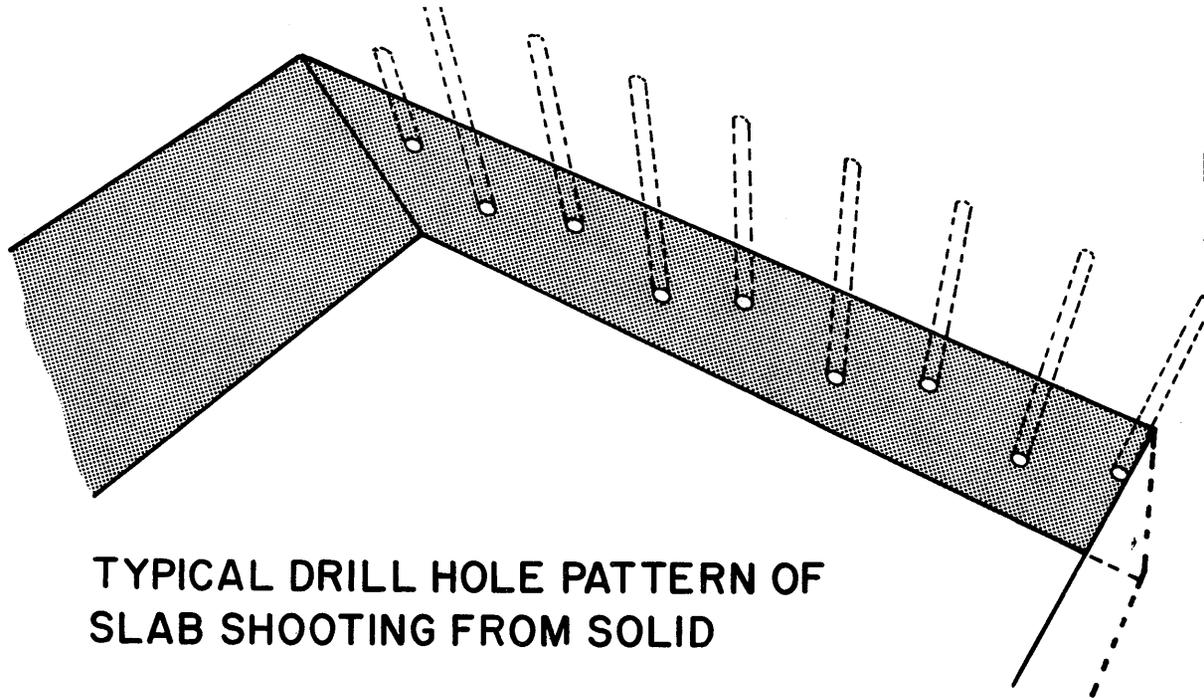
APPENDIX D
 No. 11 MINE I.D. No. 15-02290
 ADKINS COAL COMPANY

ONE-LINE DIAGRAM OF UNDERGROUND DISTRIBUTION
 CIRCUIT AT TIME OF THE EXPLOSION

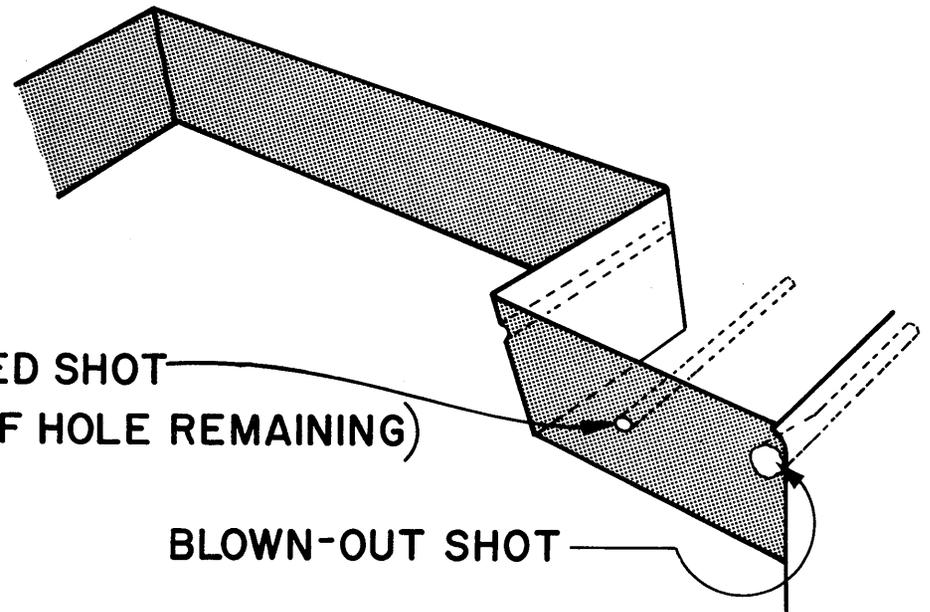
APPENDIX E

NO. II MINE ID 15-02290

ADKINS COAL COMPANY



TYPICAL DRILL HOLE PATTERN OF
SLAB SHOOTING FROM SOLID



FAILED SHOT
(74" OF HOLE REMAINING)

BLOWN-OUT SHOT

DETAILS OF FACE NO. I ENTRY

APPENDIX F

U.S. DEPARTMENT OF LABOR - MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03/15/82 TIME 1109 1112643
 SERVED TO Harold Baldrige, Supt. OPERATOR Incoal, Inc. (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)
 TYPE OF ACTION 104-(d)-(1) VIOLATION OF SECTION _____ OF THE ACT OR
 PART AND SECTION 75.0316 OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
 TYPE OF INSPECTION AFA S AND S (SEE REVERSE) WN CODES _____ P L ATD _____ DATE

CONDITION OR PRACTICE The following conditions and practices were observed on December 9, 1981 during the investigation of a coal dust explosion at this mine that occurred on December 7, 1981.

Properly installed and adequately maintained line brattice or other approved devices were not continuously used from the last open crosscut to within 10 feet of the faces of the Nos. 1, 2, and 5 entries to provide adequate ventilation.
 AREA OR EQUIPMENT The working places (1, 2, and 5) in the 007 working section

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03/15/82
 TERMINATION DUE DATE _____ TIME _____ SIGNATURE Stanley D. Allen, Jr. 2753 AR

ACTION TO TERMINATE Line brattices were installed to within 10 feet of the faces of the Nos. 1, 2 and 5 entries, prior to the issuance of this order.
 DATE 03/15/82 TIME 1110 SIGNATURE Stanley D. Allen, Jr. 2753 AR SEE CONTINUATION FORM

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3a (Jun 78)

(original issue) DATED _____ No 1112643

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03/15/82 TIME 1109
 SERVED TO Harold Baldrige, Supt. OPERATOR Incoal, Inc. (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW to the working faces for the miners and to remove flammable, explosive, and noxious gases, dust and explosive fumes. Line curtain or other approved devices were not available on the 007 working section. This is a violation of Section 75.316, 30 CFR 75.45 required by the operator's approved Ventilation System and Methane and Dust Control Plan dated July 16, 1981.

EXTENDED TO: DATE _____ TIME _____ VACATED OFFICE USE ONLY
 TERMINATED MODIFIED SEE CONTINUATION FORM DATE _____
 TYPE OF INSPECTION AFA SIGNATURE Stanley D. Allen, Jr. 2753 AR

APPENDIX F

U.S. DEPARTMENT OF LABOR—MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03, 15, 82 TIME 1112 1112644
MO DA YR (24 HR CLOCK)
 SERVED TO Harold Baldridge, Supt OPERATOR Incoal, Inc (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)
 TYPE OF ACTION 104-(d)-(1) VIOLATION OF SECTION _____ OF THE ACT OR
 PART AND SECTION 75.0401 OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
 TYPE OF INSPECTION AFA S AND S (SEE REVERSE) WN CODES _____ P L ATD _____ DATE

CONDITION OR PRACTICE The following conditions and practices were observed on December 9, 1981 during the investigation of a coal dust explosion that occurred at this mine on December 7, 1981. Evidence indicated that in the 007 working places particularly in distances less than 40 feet from the face, water, with or without a wetting agent or other no less effective methods approved by the Secretary was not applied to coal dust on the ribs and roof to reduce dispersibility and
 AREA OR EQUIPMENT All areas of the mine contained within the 007 section

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03, 15, 82
MO DA YR
 TERMINATION DUE DATE _____ TIME _____ SIGNATURE Stanley D. Allen, Jr 2753
MO DA YR (24 HR CLOCK) AR
 ACTION TO TERMINATE _____
 DATE _____ TIME _____ SIGNATURE _____ SEE CONTINUATION FORM
MO DA YR (24 HR CLOCK) AR

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000 3a (Jun 78)

(original issue) DATED _____ No 1112644
MO DA YR

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03, 15, 82 TIME 1112
MO DA YR (24 HR CLOCK)
 SERVED TO Harold Baldridge, Supt. OPERATOR Incoal, Inc (Formerly Adkins Coal Comp
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW To minimize the explosion hazards, this is a violation of Section 75.401, 30 CFR 75.

EXTENDED TO: DATE _____ TIME _____ VACATED OFFICE USE ONLY
MO DA YR (24 HR CLOCK) CODES _____ P L ATD _____
 TERMINATED MODIFIED SEE CONTINUATION FORM DATE _____
 TYPE OF INSPECTION AFA SIGNATURE Stanley D. Allen, Jr 2753
AR

APPENDIX F

MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03/15/82 TIME 1117 1112645
MO DA YR (24 HR CLOCK)
 SERVED TO Harold Baldrige, Supt. OPERATOR Incoal, Inc. (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)
 TYPE OF ACTION 104-(d)-(u) VIOLATION OF SECTION _____ OF THE ACT OR
 PART AND SECTION 75.0403 OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
 TYPE OF INSPECTION AEA S AND S (SEE REVERSE) WN CODES P L ATD

CONDITION OR PRACTICE The following conditions were determined from laboratory analysis of the mine dust survey samples collected on December 14, 1981, during the investigation of a coal dust explosion that occurred at this mine on December 7, 1981. Mine dust samples were collected on the 007 section main south headings, the first set of worked out rooms developed right off the main south, and the east main entries from the surface to where they intersect.
 AREA OR EQUIPMENT All areas of the mine contained within the 007 section.

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03/15/82
MO DA YR
 TERMINATION DUE DATE _____ TIME _____ SIGNATURE Stanley D. Allen, Jr. 2753
MO DA YR (24 HR CLOCK) AR
 ACTION TO TERMINATE _____

DATE 1/1/82 TIME _____ SIGNATURE _____ SEE CONTINUATION FORM
MO DA YR (24 HR CLOCK) AR

U.S. DEPARTMENT OF LABOR MINE SAFETY AND HEALTH ADMINISTRATION (original issue) DATED _____ No. 1112645
MSHA FORM 7000-3a (Jun 78) MO DA YR

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03/15/82 TIME 1117
MO DA YR (24 HR CLOCK)
 SERVED TO Harold Baldrige, Supt. OPERATOR Incoal, Inc. (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW the main south entries, The laboratory analysis of the samples collected outby the immediate explosion area determined that the incombustible content of 29 out of 41 samples collected was below the minimum required percentages for incombustible content for the intake and return air courses. This is a violation of Section 75.403, 30 CFR 75.

EXTENDED TO: DATE _____ TIME _____ VACATED OFFICE USE ONLY
MO DA YR (24 HR CLOCK) CODES P L ATD
 TERMINATED MODIFIED SEE CONTINUATION FORM DATE
 TYPE OF INSPECTION AEA SIGNATURE Stanley D. Allen, Jr. 2753
AR

APPENDIX F

U.S. DEPARTMENT OF LABOR—MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03/15/82 TIME 1135 1111026
SERVED TO Harold Baldrige (Supt.) OPERATOR Drum, Inc. (Formerly Adkins Coal Co.)
MINE Adkins #11 MINE I.D. 15-02290-1 (CONTRACTOR)
TYPE OF ACTION 104-d-1 VIOLATION OF SECTION _____ OF THE ACT OR
PART AND SECTION 75.1305 OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
TYPE OF INSPECTION HFA S AND S (SEE REVERSE) W N CODES _____ P L ATD _____
DATE _____

CONDITION OR PRACTICE The following practice was revealed on December 15, 1981 during the investigation of a coal dust explosion that occurred on December 7, 1981. Explosives in their original shipping paper containers were transported from the surface to the working section in the exposed metal bucket of a battery powered scarp tractor, and after reaching the working section (207) the contents of powder
AREA OR EQUIPMENT Area 207 section 1

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03/15/82
TERMINATION DUE DATE _____ TIME _____ SIGNATURE Clarence Ritchie 0057
ACTION TO TERMINATE This practice was discussed with mine management and proper explosive containers were provided.
DATE _____ TIME _____ SIGNATURE Clarence Ritchie 0057 SEE CONTINUATION FORM

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3a (Jun 78)

(original issue) DATED _____ No 1-111026

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03/15/82 TIME 1135
SERVED TO Harold Baldrige (Supt.) OPERATOR Drum, Inc. (Formerly Adkins Coal Co.)
MINE Adkins #11 MINE I.D. 15-02290-1 (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW were distributed to the working places. This is a violation of section 75.1305.300FR.

EXTENDED TO: DATE _____ TIME _____ VACATED OFFICE USE ONLY
 TERMINATED MODIFIED SEE CONTINUATION FORM DATE _____
TYPE OF INSPECTION HFA SIGNATURE Clarence Ritchie 0057

APPENDIX F

U.S. DEPARTMENT OF LABOR—MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03/15/82 TIME 11:50 1111028
SERVED TO Harold Baldridge (Supt.) OPERATOR Driscoll, Inc. Formerly Adkins Coal Co.
MINE Adkins #11 MINE I.D. 15-0229D- (CONTRACTOR)
TYPE OF ACTION 104-d-1 VIOLATION OF SECTION _____ OF THE ACT OR

PART AND SECTION 75.1303 OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
DATE _____
TYPE OF INSPECTION FEH S AND S (SEE REVERSE) WN CODES _____ P _____ L _____ ATD _____

CONDITION OR PRACTICE The following condition was observed on December 17, 1981 during the investigation of a coal dust explosion that occurred on the 007 section of this mine on December 7, 1981. A blast hole 74 inches in depth contained a contiguous train of undetonated explosives without a blasting cap. The powder in the mine was manufactured in sticks that were 12 inches long and 1.5 inches in diameter.
AREA OR EQUIPMENT The 007 section.

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03/15/82

TERMINATION DUE DATE _____ TIME _____ SIGNATURE Clarence Ritchie 0057

ACTION TO TERMINATE Suitable blasting practices were being followed.

DATE 03/15/82 TIME 11:50 SIGNATURE Clarence Ritchie 0057 SEE CONTINUATION FORM

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3a (Jun 78)

(original issue) DATED _____ No 1111028

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03/15/82 TIME 11:50

SERVED TO Harold Baldridge (Supt.) OPERATOR Driscoll, Inc. Formerly Adkins Coal Co.
MINE Adkins #11 MINE I.D. 15-0229D- (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW diameter and each stick weighed approximately one pound. The blast hole contained at least six sticks which weighed approximately six pounds. This is a violation of section 75.1303, 30 CFR 75, and the requirements of 30 CFR 15.19(e) and article IV, sections 5(B)9 of the appendix of the end of part 15.

EXTENDED TO: DATE _____ TIME _____ VACATED OFFICE USE ONLY
CODES _____ P _____ L _____ ATD _____

TERMINATED MODIFIED SEE CONTINUATION FORM DATE _____

TYPE OF INSPECTION FEH SIGNATURE Clarence Ritchie 0057

APPENDIX F

U.S. DEPARTMENT OF LABOR - MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03/15/82 TIME 11:40 1111027
 SERVED TO Harold Baldridge (Dupty) OPERATOR DuPont, Inc. (Formerly Adkins Coal Co.)
 MINE Adkins #11 MINE I.D. 15-02290- (CONTRACTOR)
 TYPE OF ACTION 104-d-1, - - - - - VIOLATION OF SECTION - - - - - OF THE ACT OR
 PART AND SECTION 75.1303- - - - - OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
 TYPE OF INSPECTION HFR S AND S (SEE REVERSE) W N CODES - - - - - P - L - - - - - ATD - - - - -
 DATE

CONDITION OR PRACTICE The following practices were revealed on December 11, 1981, during the investigation of a coal dust explosion. Fire holes ranging in depth from approximately 4 to 10 feet and charged with at least 4 to 6 pounds of permissible explosives were detonated without stemming and the plug wrappers that contained the powder was deliberately removed by slitting so that it could be compacted
 AREA OR EQUIPMENT The 007 section

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03/15/82
 TERMINATION DUE DATE - - - - - TIME (24 HR CLOCK) SIGNATURE Clarence Ritchie 0057
 ACTION TO TERMINATE Suitable blasting practices were being conducted prior to the issuance of this order.
 DATE - - - - - TIME (24 HR CLOCK) SIGNATURE Clarence Ritchie 0057 SEE CONTINUATION FORM

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3a (Jun 78)

(original issue) DATED - - - - - No. 1111027-

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03/15/82 TIME 1140
 SERVED TO Harold Baldridge (Dupty) OPERATOR DuPont, Inc. (Formerly Adkins Coal Co.)
 MINE Adkins #11 MINE I.D. 15-02290- (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW on the hole on the (007) section. This is a violation of section 75.1305, 30 CFR 75 and the requirement of 30 CFR 15.119(e) and article IV, section 5(b)9 of the appendix at the end of part 15.

EXTENDED TO: DATE - - - - - TIME (24 HR CLOCK) VACATED OFFICE USE ONLY
 TERMINATED MODIFIED SEE CONTINUATION FORM DATE - - - - -
 TYPE OF INSPECTION HFR SIGNATURE Clarence Ritchie 0057 AR

APPENDIX F

U.S. DEPARTMENT OF LABOR—MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3 (Jun 78)

CITATION (SEE REVERSE) ORDER OF WITHDRAWAL (SEE REVERSE) DATE 03/15/82 TIME 1105 1112642
MO DA YR (24 HR CLOCK)
 SERVED TO Harold Baldrige, Supt OPERATOR Incoal, Inc (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)
 TYPE OF ACTION L 04-(d)-(1) VIOLATION OF SECTION _____ OF THE ACT OR
 PART AND SECTION 75.1307 OF TITLE 30 CODE OF FEDERAL REGULATIONS: OFFICE USE ONLY
DATE
 TYPE OF INSPECTION AEA S AND S (SEE REVERSE) W N CODES _____ P _____ L _____ ATD _____ / _____ / _____

CONDITION OR PRACTICE The following condition was observed on December 7, 1981 during an investigation of a coal dust explosion at this mine.
Explosives for use in the 007 working places were not kept in separate closed containers located out of the line of blast and not less than 50 feet from the working face and 15 feet from power lines. Explosives in their original containers were stored in the working places in the Nos 2, 3, 4, and 6
 AREA OR EQUIPMENT All areas of the mine contained within the 007 section.

INITIAL ACTION NOTICE CITATION ORDER NO. 1112641 DATED 03/15/82
MO DA YR
 TERMINATION DUE DATE _____ TIME _____ SIGNATURE Stanley D. Allen, Jr 2753
MO DA YR (24 HR CLOCK) AR
 ACTION TO TERMINATE The explosives have been removed from the mine prior to the issuance of this order.
 DATE 03/15/82 TIME 1105 SIGNATURE Stanley D. Allen, Jr 2753 SEE CONTINUATION FORM
MO DA YR (24 HR CLOCK) AR

U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
MSHA FORM 7000-3a (Jun 78)

(original issue) DATED _____ No 1112642
MO DA YR

SUBSEQUENT ACTION CONTINUATION CITATION ORDER DATE 03/15/82 TIME 1105
MO DA YR (24 HR CLOCK)
 SERVED TO Harold Baldrige Supt. OPERATOR Incoal, Inc. (Formerly Adkins Coal Company)
 MINE Adkins #11 MINE I.D. 15-02290 (CONTRACTOR)

JUSTIFICATION FOR ACTION CHECKED BELOW entries. This is a violation of Section 75.1307, 30 CFR 75.

EXTENDED TO: DATE _____ TIME _____ OFFICE USE ONLY
CODES _____ P _____ L _____ ATD _____ / _____ / _____
MO DA YR (24 HR CLOCK)
 TERMINATED MODIFIED SEE CONTINUATION FORM DATE
 TYPE OF INSPECTION AEA SIGNATURE Stanley D. Allen, Jr 2753
AR

ANALYTICAL REPORT - APPENDIX G

MINE: No. 11 COMPANY: ADKINS COAL COMPANY DATE ANALYZED 12/08/81
 ADDRESS KITE, KENTUCKY REPORTED TO J. Banfield

SAMPLE IDENTIFICATION	LOCATION IN MINE		PERCENT									
			O ₂	N ₂	CO ₂	CH ₄	CO ppm	C ₂ H ₄ ppm	C ₂ H ₆ ppm	C ₂ H ₂ ppm	H ₂ ppm	Ar
	Fan Discharge (Front of Fan)											
1S	12/07/81	6:30p	20.76	78.01	0.24	0.03	998	49	8	26	505	0.92
2S	12/07/81	7:05p	20.70	77.76	0.23	0.03	1000	49	8	26	534	0.92
3S	12/07/81	7:35p	20.74	77.93	0.23	0.03	992	48	8	25	494	0.92
4S	12/07/81	8:00p	20.76	77.92	0.23	0.02	965	47	8	25	488	0.92
5S	12/07/81	8:37p	20.81	77.93	0.19	0.02	778	39	6	20	395	0.92
6S	12/07/81	9:05p	20.83	77.94	0.18	0.02	700	34	6	18	319	0.92
7	12/07/81	9:35p	20.81	77.96	0.18	0.02	722	36	7	18	319	0.92
8	12/07/81	10:00p	20.81	77.96	0.18	0.02	684	35	6	17	320	0.92
9	12/07/81	10:30p	20.84	77.93	0.17	0.02	615	31	5	16	616	0.92
10	12/07/81	10:40p	20.85	77.94	0.17	0.02	586	29	5	15	314	0.93
11	12/07/81	11:15p	20.87	77.96	0.16	0.01	522	27	5	13	244	0.93
12	12/07/81	11:45p	20.85	77.93	0.16	0.01	600	31	5	16	587	0.93
13	12/08/81	12:15a	20.86	77.93	0.16	0.01	576	29	5	16	575	0.93
14	12/08/81	12:45a	20.90	77.99	0.15	0.01	487	25	4	13	261	0.93

DATE 12/21/81 SIGNED *Roberta J. Jackson*

TOXIC MATERIALS DIVISION, PHTC

UNITED STATES DEPARTMENT OF LABOR
MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

APPENDIX H

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981MINE No. 11 COMPANY Adkins Coal CompanyCOLLECTED BY Ronald Suttles and Ray Williams

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
		first left section off main headings, 20 feet in by centerline survey station No. 323, No. 1 entry, survey No. 1			
		No. 1 entry, return			
1A-1	band	0 + 00'	21.5	small	26.5
1A-2	do	0 + 100'	25.5	large	39.7
1A-3	do	0 + 200'	5.7	extra-large	27.7
1A-3X	do	0 + 230'	5.6	large	35.4
1A-4	do	0 + 300'	13.3	large	27.6
1A-5	do	0 + 400'	16.8	extra-large	27.9
1A-5X	do	0 + 430'	14.0	extra-large	26.9
1A-6	do	0 + 500'	19.3	large	25.8
		No. 2 entry, return			
1B-1	do	0 + 00'	20.2	small	25.5
1B-2	do	0 + 100'	36.6	large	50.7
1B-3	do	0 + 200'	13.7	large	30.8
1B-3X	do	0 + 230'	15.3	small	27.5
1B-4	do	0 + 300'	21.8	large	37.6
1B-5	do	0 + 400'	12.7	extra-large	27.4
1B-5X	do	0 + 430'	15.1	extra-large	27.8
1B-6	do	0 + 500'	18.1	large	24.6

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 MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

APPENDIX H

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Ronald Suttles and Ray Williams

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
No. 3 entry, return					
1C-1	band	0 + 00'	24.7	trace	31.5
1C-2	do	0 + 100'	18.3	trace	27.5
1C-3	do	0 + 200'	21.2	extra-large	34.8
1C-3X	do	0 + 230'	17.6	large	29.8
1C-4	do	0 + 300'	23.0	large	25.3
1C-5	do	0 + 400'	19.6	extra-large	26
1C-5X	do	0 + 430'	15.2	extra-large	39.5
1C-6	do	0 + 500'	18.5	extra-large	26.1
No. 4 entry, return					
1D-1	do	0 + 00'	21.4	trace	28
1D-2	do	0 + 100'	21.1	trace	24
1D-3	do	0 + 200'	24	large	30.1
1D-3X	do	0 + 230'	3.5	large	33.6
1D-4	do	0 + 300'	12.7	extra-large	25.7
1D-5	do	0 + 400'	12.8	extra-large	38.8
1D-5X	do	0 + 430'	14.7	extra-large	23.3
1D-6	do	0 + 500'	14.6	extra-large	34.7
No. 5 entry, return					
1E-1	do	0 + 00'	24	trace	22
1E-2	do	0 + 100'	23	small	32
1E-3		0 + 200' - wet - no sample			
1E-3X		0 + 230' - wet - no sample			
1E-4	do	0 + 300'	13	extra-large	27.3

UNITED STATES DEPARTMENT OF LABOR
MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Ronald Suttles and Ray Williams

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
IE-5	band	0 + 400'	17	extra-large	25.9
IE-5X	do	0 + 430'	39.3	large	60.5
IE-6	do	0 + 500'	17.2	large	24.1
		No. 6 entry, return			
IF-1		0 + 00' - wet, no sample			
IF-2		0 + 100' - wet, no sample			
IF-3		0 + 200' - wet, no sample			
IF-4		0 + 300'	10.5	large	34
IF-5		0 + 400'	15.3	large	26
IF-6		0 + 500'	18.6	large	36.6

UNITED STATES DEPARTMENT OF LABOR
MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Don Suttle and Ray Williams

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
		second right section off main headings, 20 feet in by centerline survey station No. 299, No. 6 entry, survey No. 2			
		No. 1 entry, intake			
2A1	band	0 + 00'	14.9	small	17
2A2	do	0 + 100'	6.1	small	17
2A3		0 + 200', wet, no sample			
2A3X		0 + 230', wet, no sample			
		No. 2 entry, intake			
2B1	do	0 + 00'	18.5	small	20
2B2	do	0 + 100'	14.4	small	13
2B3		0 + 200', wet, no sample			
2B3X		0 + 230', wet, no sample			
		No. 3 entry, intake			
2C1	do	0 + 00'	22.4	trace	26
2C2	do	0 + 100'	37.7	trace	42
2C3		0 + 200', wet, no sample			
2C3X		0 + 230', wet, no sample			

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MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Don Suttles and Ray Williams

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
		No. 4 entry, intake			
2D1	band	0 + 00'	25.6	none	30
2D2	do	0 + 100'	25.8	trace	46
2D3	do	0 + 200', wet, no sample			
2D3X	do	0 + 230', wet, no sample			
		No. 5 entry, intake			
2E1	do	0 + 00'	25.4	trace	53
2E2	do	0 + 100'	8.4	trace	17
2E3	do	0 + 200', wet, no sample			
2E3X	do	0 + 230', wet, no sample			
		No. 6 entry, intake			
2F1	do	0 + 00'	24.4	trace	55
2F2	do	0 + 100'	40.4	none	67
2F3		0 + 200', wet, no sample			

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MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

APPENDIX H

TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Roy Parker and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
		first right off mains, 20 feet inby centerline, survey station 892, No. 6 entry, survey No. 3			
		No. 1 entry, intake			
3A1	band	0 + 00', wet, no sample	14.3	none	17
3A2		0 + 100'			
3A3		0 + 200', wet, no sample			
3A3X		0 + 230', wet, no sample			
		No. 2 entry, intake			
3B1	do	0 + 00'	28	none	46
3B2	do	0 + 100'	27.2	none	33
3B3		0 + 200', wet, no sample			
3B3X		0 + 230', wet, no sample			
		No. 3 entry, intake			
3C1	do	0 + 00'	31.3	none	42
3C2	do	0 + 100'	24.3	none	37
3C3		0 + 200', wet, no sample			
3C3X		0 + 230', wet, no sample			
		No. 4 entry, intake			
3D1	do	0 + 00'	19.6	none	15
3D2	do	0 + 100'	22	none	22
3D3		0 + 200', wet, no sample			
3D3X		0 + 230', wet, no sample			

UNITED STATES DEPARTMENT OF LABOR
MSHA LABORATORIES - MOUNT HOPE, WEST VIRGINIA

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED _____ December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Roy Parker and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
		No. 5 entry, intake			
3E1	band	0 + 00'	25.5	none	45
3E2	do	0 + 100'	19.2	none	30
3E3		0 + 200', wet, no sample			
3E3X		0 + 230', wet, no sample			
		No. 6 entry, intake			
3F1	do	0 + 00'	19.2	none	27
3F2		0 + 100', wet, no sample			
3F3		0 + 200', wet, no sample			
3F3X		0 + 230', wet, no sample			

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TABLE - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Ronald Honeycutt, Roy Parker, Paul Watson, and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
		007 section, main headings, 20 feet in by centerline, survey station 353, No. 1 entry, survey No. 4			
		No. 1 entry, return			
4A-1	band	0 + 00'	17.1	extra-large	34.8
4A-2		0 + 100', wet-no sample			
4A-3	band	0 + 200'	20.5	small	15
4A-3X	do	0 + 230'	21.7	small	11
4A-4	do	0 + 300'	27.9	extra-large	44.1
4A-5	do	0 + 400'	18.0	large	29.2
4A-6	do	0 + 500'	17.5	large	30.2
4A-6X	do	0 + 530'	35.5	extra-large	32.5
4A-7	do	0 + 600'	29.5	large	26.5
4A-8		0 + 700', wet-no sample			
4A-9		0 + 800', wet-no sample			
4A-9X		0 + 830', no sample received			
4A-10		0 + 900', wet-no sample			
4A-11		0 + 1,100', wet-no sample			
4A-12		0 + 1,300', wet-no sample			
4A-12X		0 + 1,330', wet-no sample			
4A-13		0 + 1,500', wet-no sample			
4A-14		0 + 1,700', wet-no sample			
4A-15		0 + 1,900', wet-no sample			

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Ronald Honeycutt, Roy Parker, Paul Watson, and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
No. 2 entry, return					
4B-1	band	0 + 00'	15.1	large	19.5
4B-2	do	0 + 100'	14.7	extra-large	21.2
4B-3	do	0 + 200'	18.8	extra-large	27.6
4B-3X		0 + 230', wet-no sample			
4B-4	do	0 + 300'	23.9	extra-large	30.9
4B-5	do	0 + 400'	26.7	large	27.1
4B-6	do	0 + 500'	24.6	extra-large	28.2
4B-6X		0 + 530', wet-no sample			
4B-7	do	0 + 600'	22.2	small	23
4B-8	do	0 + 700'	23.4	small	29
4B-9		0 + 800', wet-no sample			
4B-9X		0 + 830', wet-no sample			
4B-10		0 + 900', wet-no sample			
4B-11	do	0 + 1,100'	16.9	trace	35
4B-12	do	0 + 1,300'	16.5	trace	45
4B-12X	do	0 + 1,330'	18.8	trace	47
4B-13		0 + 1,500', wet-no sample			
4B-14		0 + 1,700', wet-no sample			
No. 3 entry, intake, conveyor belt entry					
4C-1	do	0 + 00'	14.7	extra-large	25.4
4C-2	do	0 + 100'	17.2	extra-large	27.7
4C-2X	do	0 + 120'	19.7	small	16
4C-3	do	0 + 200'	18.6	small	16
4C-3X	do	0 + 220'	18.2	small	25
4C-4	do	0 + 300'	17.4	large	41.2
4C-5	do	0 + 400'	16.1	small	47

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11 COMPANY Adkins Coal Company

COLLECTED BY Ronald Honeycutt, Roy Parker, Paul Watson, and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
4C-6	band	0 + 500'	22.2	small	42
4C-6X	do	0 + 520'	12.7	large	33.2
4C-7	do	0 + 600'	7.6	small	67
4C-8	do	0 + 700'	16.1	small	82
4C-8X	do	0 + 720'	21.2	small	47
4C-9X	do	0 + 820'	22.1	small	27
4C-9	do	0 + 800'	17.4	small	80
4C-10	do	0 + 900'	20.2	small	84
4C-11	do	0 + 1,100'	16.1	trace	85
4C-12		wet, no sample			
4C-13	do	0 + 1,500'	28.1	none	77
4C-14	do	sample received	11.7	none	77
4C-15		wet, no sample			
		No. 4 entry, intake			
4D1	do	0 + 00'	24.3	extra-large	21.5
4D2	do	0 + 100'	28.3	extra-large	28.6
4D3	do	0 + 200'	20.8	small	27
4D3X	do	0 + 230', no sample received			
4D4	do	0 + 300'	28.9	small	29
4D5	do	0 + 400'	14.5	small	28
4D6	do	0 + 500'	24.2	small	27
4D6X	do	sample received	28.7	trace	60
4D7	do	0 + 600'	10.4	small	30
4D8	do	0 + 700'	14.1	trace	47
4D9	do	0 + 800'	8.3	trace	53
4D9X	do	wet, no sample			
4D10	do	0 + 900'	22.4	small	49
4D11		wet, no sample			
4D12	do	0 + 1,300'	16.1	none	61
4D12X		wet, no sample			

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11

COMPANY Adkins Coal Company

COLLECTED BY Ronald Honeycutt, Roy Parker, Paul Watson, and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
4D-13	band	0 + 1,500'	10.5	none	57
4D-14	do	0 + 1,700'	13.2	none	99
4D-15	do	0 + 1,900'	17.5	none	93
No. 5 entry, intake					
4E-1	do	0 + 00'	21.1	large	22.6
4E-2	do	0 + 100'	8.5	large	30.4
4E-3	do	0 + 200'	16.5	large	31.8
4E-3X	do	0 + 230'	14.7	extra-large	33.0
4E-4	do	0 + 300'	21.5	small	51
4E-5	do	0 + 400'	23.9	large	32.1
4E-6	do	0 + 500'	17.5	small	43
4E6X	do	0 + 530'	22.5	small	27
4E7	do	0 + 600'	24.0	trace	57
4E8	do	0 + 700'	8.4	trace	37
4E9	do	0 + 800'	15.6	trace	46
4E9X	do	0 + 830'	20.2	trace	43
4E10	do	0 + 900'	17.5	trace	67
4E11	do	0 + 1,100'	14.1	trace	67
4E12	do	0 + 1,300'	13.0	none	73
4E12X		wet, no sample			
4E13	do	0 + 1,500'	20.0	none	75
4E14	do	0 + 1,700'	8.0	none	73
4E15		wet, no sample			
No. 6 entry, intake					
4F1	do	0 + 00'	28.2	large	18.3

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TABLE _____ - ANALYSES OF DUST SAMPLES COLLECTED December 14, 1981

MINE No. 11

COMPANY Adkins Coal Company

COLLECTED BY Ronald Honeycutt, Roy Parker, Paul Watson, and Lester Banks

CAN NUMBER	SAMPLE OF DUST FROM	LOCATION IN MINE	PERCENT FLOAT DUST	ALCOHOL COKE TEST	PERCENT INCOMBUSTIBLE
4F-2	band	0 + 100'	30.1	extra-large	29.7
4F-3	do	0 + 200'	27.3	large	30.0
4F-4	do	0 + 300'	24.0	small	34
4F-5	do	0 + 400'	16.0	small	33
4F-6	do	0 + 500'	15.8	small	32
4F-7	do	0 + 600'	12.2	trace	38
4F-8	do	0 + 700'	8.1	trace	47.5
4F-9	do	wet, no sample			
4F-10	do	0 + 900'	24.2	none	31.5
4F-11	do	0 + 1,100'	29.3	none	47
4F-12	do	0 + 1,300'	32.1	none	59
4F-13	do	wet, no sample			
4F-14	do	0 + 1,700'	35.1	none	59
4F-15	do	0 + 1,900'	14.7	none	50