

UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION  
Coal Mine Safety and Health

Report of Investigation

Underground Coal Mine

Fatal Fall of Roof Accident

June 6, 2005

South Central Coal Company, Inc.  
South Central Mine  
Spiro, Le Flore County, Oklahoma  
Mine ID No. 34-01787

Investigators

Jeff Fleshman  
Mining Engineer

Billy D. Owens  
Supervisory Mining Engineer

Paul L. Tyrna  
Mining Engineer/Geologist

David L. Weaver  
Supervisory Training Specialist

Joseph C. Zelanko  
Supervisory Mining Engineer

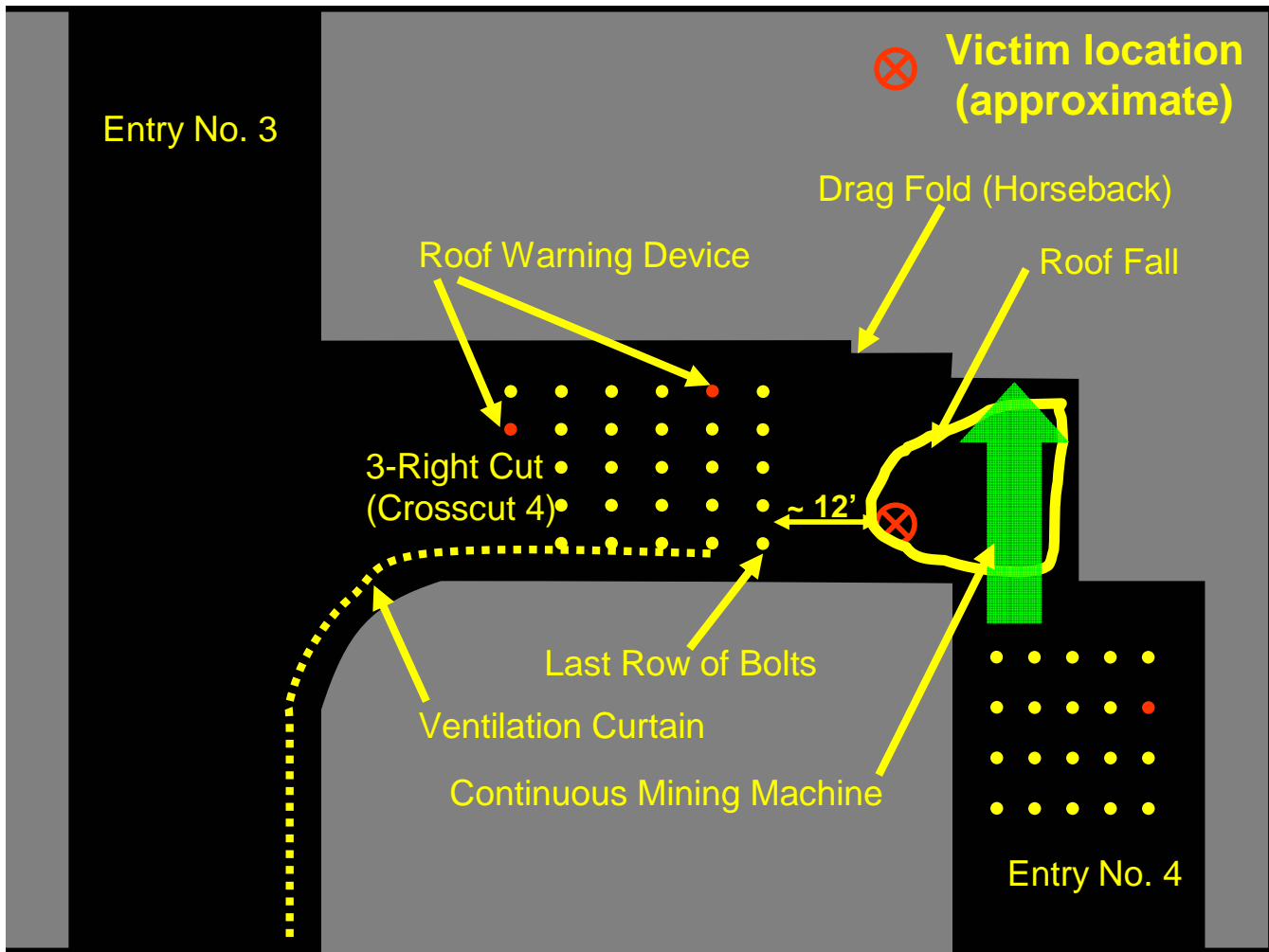
Originating Office  
Mine Safety and Health Administration  
District 9  
Denver Federal Center  
P.O. Box 25367, Denver, Colorado 80225  
Allyn C. Davis, District Manager

TABLE OF CONTENTS

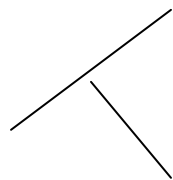
	<u>Page</u>
SKETCH OF ACCIDENT SITE.....	1
OVERVIEW.....	2
GENERAL INFORMATION.....	2
DESCRIPTION OF THE ACCIDENT.....	3
INVESTIGATION OF THE ACCIDENT.....	4
DISCUSSION.....	5
ROOT CAUSE ANALYSIS.....	8
CONCLUSION.....	10
ENFORCEMENT ACTIONS.....	11
APPENDICES:	
A. List of Persons Participating in the Investigation.....	13
B. Sketch of Afternoon Shift Cut Sequence.....	14
C. Picture of Roof Warning Device at Accident Site.....	15
D. Picture of Both Roof Warning Devices at Accident Site..	16
E. Sketch of 1 <sup>st</sup> South Section and Roof Warning Devices....	17

FATAL ROOF FALL ACCIDENT  
SOUTH CENTRAL MINE (ID NO. 34-01787)  
SOUTH CENTRAL COAL COMPANY, INC.  
SPIRO, LE FLORE COUNTY, OKLAHOMA  
JUNE 6, 2005

SKETCH OF ACCIDENT SITE  
1<sup>ST</sup> SOUTH SECTION



NOT TO SCALE



7-8° DIP

## OVERVIEW

On Monday, June 6, 2005, Kenneth J. Orton, a 33-year old electrician, was fatally injured when he was struck by falling roof material that measured approximately 8 feet long, 4.5 feet wide, and 4 to 19 inches thick. Orton was in an area of unsupported roof, approximately 12 feet in by the last row of permanent roof support, when the accident occurred. Orton had 8 years and 45 weeks of mining experience.

The direct causes of the fatal accident were traveling in an area of unsupported roof and management's failure to ensure that the area was roof bolted prior to mining into the unsupported area. Contributing causes included failure to completely bolt the unsupported area (3-Right cut) on cycle, due to water accumulations in the face, and miscommunications regarding the presence of the unsupported roof where the accident occurred. Two possible contributing causes exist depending on Orton's route of travel into 3-Right cut. One was the extra roof warning device located approximately 20 feet out by the last row of roof supports, which potentially caused confusion and complacency as to the actual location of the end of roof supports. The second was the lack of a visible roof warning device when approaching on the ventilation curtain side of the place.

## GENERAL INFORMATION

The South Central Mine is an underground coal mine operated by South Central Coal Company, Inc., and is located near Spiro, Le Flore County, Oklahoma. The mine is accessed through drifts into the Hartshorne coal seam at the base of a shallow surface mine pit. The coal seam averages five feet thick and dips seven to eight degrees to the northwest. Overburden ranges from 50 feet near the portals to 750 feet at the deepest penetration of the mine. There are no known mines above, below, or adjacent to the mine.

At the time of the accident, the mine produced 530 tons of coal per day and employed 35 underground miners and 13 surface workers. The mine worked Monday through Friday, using two 10-hour production shifts and one maintenance shift per day.

Coal was extracted from the development sections by remote-controlled Joy 14 CM 15 continuous mining machines and was transported by Joy 10-SC shuttle cars. Roof supports were installed utilizing a Fletcher roof bolting machine.

The mine liberated 1,519,154 cubic feet of methane per 24-hour period and was ventilated by an exhausting Jeffrey axivane main mine fan, model 84-700, and an exhausting Spendrup axivane main mine fan, model 1050.

The principal officers for the mine were:

Bobby G. Meadows, Jr.	President
Timothy Ball	Vice President
Willard Deel	Section Foreman

Prior to the accident, the last regular safety and health inspection conducted by the Mine Safety and Health Administration (MSHA) was completed on February 11, 2005. The non-fatal days lost (NFDL) injury incidence rate for the South Central Mine for the previous quarter was 18.16 compared to the national NFDL rate of 5.17.

#### **DESCRIPTION OF ACCIDENT**

On Monday, June 6, 2005, the second shift miners entered the mine under the supervision of Willard Deel, Section Foreman, and arrived on the 1<sup>st</sup> South development section at 3:40 p.m. Normal mining activities commenced, following a typical cut sequence from the right (intake) side of the section to the left (return) side (refer to Appendix B).

While mining entry No. 3 (cut No. 4 on Appendix B), a geologic fault and drag fold were encountered that produced excessive amounts of water from the roof and floor. This water flowed outby and into the 3-Right working place, accumulating in the unbolted area mined during the previous cut (cut No. 3 on Appendix B). After mining was completed in entry No. 3, Jason Schafer, Right Side Roof Bolter Operator, and Troy Rowland, Left Side Roof Bolter Operator, entered the 3-Right working place and installed three rows of bolts. They did not bolt the remainder of the cut because water had accumulated near the face. This left an unsupported area approximately 16 feet long and 21 feet wide. Schafer and Rowland then proceeded to the working place in entry No. 3, where roof rock had fallen near the face. The fallen rock prevented the roof bolting machine drill heads from being extended near the face, so a portion of this cut was also left unsupported.

Schafer and Rowland then bolted the 2-Left working place (cut No. 5 on Appendix B) before moving the roof bolting machine to the 5-Right working place (cut No. 6 on Appendix B). While moving across the section, they spoke with Larry Carpenter,

Continuous Mining Machine Operator, and told him that 3-Right cut (cut No. 3 on Appendix B) was not fully bolted. However, Carpenter had difficulty hearing over the equipment noise and perceived them to say that three rows of bolts were not installed in the face of entry No. 3 and that the cut in 3-Right was bolted. Schafer and Rowland then proceeded to 5-Right while Carpenter moved the continuous mining machine to the working place in entry No. 4 and started mining (cut No. 7 on Appendix B).

While entry No. 4 was mined, Kenneth J. Orton, Electrician/victim, performed duties as helper on the continuous mining machine. When the working face of entry No. 4 cut into the unbolted area of the 3-Right cut, the shuttle car operators noticed water flowing from the face and asked Orton if they had mined into another area similar to the face of entry No. 3, where an abnormal amount of water was encountered.

Orton left the area, traveled outby around the pillar block and into 3-Right cut. At that time, approximately 11:05 p.m., Carpenter completed the left lift of cut No. 7. As Carpenter backed the continuous mining machine out of the cut, portions of the immediate roof fell and covered the inby 20 feet of the machine. The fall of immediate roof also extended into the unsupported area of the 3-Right cut, striking Orton. When the roof fell, Carpenter noticed a flash of light in the newly created intersection. Carpenter immediately stopped mining, traveled outby around the pillar block and into 3-Right cut where he found Orton under the fall of roof in the unsupported area (see sketch on page No. 1 for Orton's location at the time of the accident).

Orton was removed from under the fall and transported to the surface. He was treated by paramedics and taken by ambulance to the Sparks Regional Medical Center in Fort Smith, Arkansas, where he was pronounced dead.

#### **INVESTIGATION OF THE ACCIDENT**

Micheal Olsen, MSHA Supervisory Coal Mine Safety and Health Inspector at McAlester, Oklahoma, was notified of the accident by a telephone call from Bobby Meadows, Jr., President of the South Central Coal Company, at approximately 11:55 p.m., June 6, 2005. An order was issued pursuant to Section 103(k) of the Mine Act to ensure the safety of the miners until an investigation could be conducted.

MSHA's accident investigation team traveled to the mine, conducted an inspection of the accident site, interviewed employees, and reviewed employee and company records relevant to the accident. MSHA conducted the investigation with the assistance of mine management, mine employees, and the State of Oklahoma Department of Mines.

## DISCUSSION

### General Information:

The accident occurred on June 6, 2005, at 11:05 p.m. in the 1<sup>st</sup> South development section, in an unbolted area referred to as the 3-Right cut by mine officials. This area was also shown on the mine map as crosscut No. 4, between entry Nos. 3 and 4.

The 1<sup>st</sup> South section was being developed with five entries on 70-foot centers. The dip of the coal seam was 7 to 8 degrees to the northwest.

### Geologic Conditions:

Although the coal seam was typically 60 inches thick, one to three feet of the immediate roof was usually mined with the coal resulting in a mined height ranging from 72 to 96 inches. However, in some parts of the 1<sup>st</sup> South section, the immediate roof was left in place and supported. The mined height in the accident area was 96 inches, indicating that part of the immediate roof had been mined with the coal. The immediate roof throughout the 1<sup>st</sup> South section was laminated shale and mudstone with slickensided ramp faults, bedding plane faults and drag folds (horsebacks).

Mining encountered a drag fold in the face of No. 3 entry that halted development and produced an abnormal amount of water. Some of the water from the face of entry No. 3 flowed into and accumulated in the idle, unbolted face in 3-Right cut. Attempts were made by Willard Deel, Section Foreman, to prevent the water from entering and accumulating in 3-Right cut, but were not successful.

The drag fold encountered in the entry No. 3 face extended into 3-Right cut (the accident site) and formed the left side of the fall cavity. The overburden in the fall area was between 280 and 300 feet.

Roof fall material covered the forward 20 feet of the continuous mining machine. The material consisted of various sized tabular

slabs up to a maximum of 8 feet by 7 feet by 2 feet thick. The larger slabs exhibited highly polished upper surfaces that coincided with a nearly horizontal slickensided bedding plane fault that formed the upper boundary of the fall cavity. The rock that fell on Orton was approximately 8 feet long, 4.5 feet wide, and 4 to 19 inches thick. The victim was located approximately 5 feet from the right rib and 12 feet inby the last row of supports. Prior to the breakthrough, the unsupported area inby the last row of roof bolts in 3-Right cut was approximately 16 feet long and 21 feet wide. After the breakthrough and at the time of the accident, the unsupported area was approximately 26 feet 6 inches long and 20 to 21 feet wide.

#### Examinations:

The written "Preshift Mine Examiner's Report" for the preshift/onshift examination conducted on the 1<sup>st</sup> South section from 8:30 p.m. to 9:30 p.m. on June 6, 2005, indicates that entry No. 3 (cut No. 4) and 3-Right cut (cut No. 3 in crosscut No. 4) were "not bolted." The actual date, time, and initials found at 3-Right indicate that the exam was made at 8:36 p.m. by W.D. (Willard Deel). These were found on a roof bolt plate near the inby corner of the crosscut. This indicates Deel knew that 3-Right cut was unbolted at that time. Interviews with the roof bolters could not determine the times when bolting occurred in cut Nos. 3 and 4. In his interview, Deel stated that he did not know that 3-Right cut had been left partially unbolted. Deel did not return to re-examine the 3-Right cut prior to the breakthrough from entry No. 4 (cut No. 7). However, he was aware that water from entry No. 3 face was flowing into 3-Right cut and he unsuccessfully tried to correct this problem.

Date, time, and initials were also observed in entry No. 4 on a roof bolt plate on the next to last row of bolts. These were made at 8:38 p.m. by Willard Deel. This indicates that Deel examined entry No. 4 prior to cut No. 7 being made into 3-Right cut. Knowing the mining cycle, Deel would have been aware that cut No. 7 would breakthrough into 3-Right cut; however, he failed to return to 3-Right cut to ensure that it had been bolted. The certified foreman in charge of a working section is required to conduct an on-shift examination of the section at least once during each shift, or more often if necessary for safety.



### Roof Control:

A Fletcher twin-boom roof bolting machine, model No. DDO-13, in conjunction with a T-bar type ATRS system rated at 36,000 pounds was used for installation of roof bolts for primary roof supports.

The roof was supported with 6-foot long, No. 5, resin grouted rebar roof bolts in conjunction with 6- by 16-inch roof bolt plates throughout the section. These roof supports were installed on a 4- by 4-foot pattern in accordance with the roof control plan approved April 1, 2005. Typically, the entries and crosscuts were mined at less than 20 feet wide.

### Warning Devices for End of Roof Supports:

A reflective warning device was installed on the next to last row of roof bolts on the left side of the entry in the 3-Right accident area (see Appendix C for a picture of this warning device). At the time of the accident, a ventilation curtain was hung from the roof near the right rib in 3-Right, which provided blowing ventilation for the mining and roof bolting operations in the crosscut (see Sketch on Page 1 for the location of this curtain). Although the investigation could not determine Orton's route of travel, he may have walked between the curtain and the rib when he entered 3-Right. Thus, the curtain would have obstructed Orton's view of the reflective warning device located on the left side of the crosscut.

In 3-Right just outby the accident area, a second roof warning device was installed on the left side of the place, five rows outby the last row of permanent roof supports (see Sketch on Page 1 for location). This placed two roof warning devices in the same crosscut with the second one approximately 16 feet outby the one on the next to last row of bolts (see Appendix D for a picture of these two devices). The 1<sup>st</sup> South section had four other roof warning devices hanging in areas that were not near the last row of permanent roof supports (see Appendix E for the location of devices on the section). These extra warning devices defeated the intent of the warning system, potentially caused confusion, and promoted complacency as to the proper location of the end of permanent roof supports.

### Miscellaneous:

Orton performed his normal electrician duties during the shift, but was performing continuous mining machine helper duties just prior to the accident.

Orton was last seen by a shuttle car operator in entry No. 4 approximately two minutes prior to the accident.

Training and Experience:

Orton had a total of 8 years and 45 weeks of mining experience. He was a qualified electrician and had received annual refresher training in accordance with 30 CFR 48.28 on June 26, 2004. Orton had received task training for being an electrician, a general laborer, and for duties on the continuous mining machine, roof bolter, scoop, and shuttle cars.

**ROOT CAUSE ANALYSIS**

A root cause analysis was conducted. The following causal factors were identified that could have averted the accident entirely or mitigated the severity of the accident:

1. **Causal Factor:** Orton traveled inby permanent roof supports, which exposed him to an area of unsupported roof in 3-Right cut (located in crosscut No. 4, between entry Nos. 3 and 4) and to the fall of roof that caused the fatal accident. A number of potential factors may have contributed to Orton traveling beyond permanent supports, including:

- a) The air current from the breakthrough was coursing through 3-Right cut, and would have placed Orton in the dust and water mist from the mining operation, which could have substantially reduced Orton's visibility and may have caused Orton not to see the reflective roof warning device.
- b) Orton may not have been aware that the roof in 3-Right cut was unbolted, and he may have walked into the unsupported area unknowingly and without checking the roof as he entered. Orton was most likely looking at the floor and the accumulation of water on the floor because of discussions with the shuttle car operators.
- c) Depending on Orton's route of travel into 3-Right, which could not be determined during the investigation, he may have walked between the ventilation curtain and the right rib. Thus, the curtain would have prevented Orton from seeing the reflective warning device that was hanging from the roof on the left side of the crosscut.
- d) An extra roof warning device was located outby in 3-Right at the accident site, which, depending on Orton's route of

travel, may have confused him as to the proper location of the end of permanent roof supports or caused complacency as to the use of these warning devices.

Corrective Action: The mine operator should develop procedures and means to ensure that persons do not work or travel beyond permanent roof supports. These should include removal of roof warning devices when places are completely bolted; installation of roof warning devices on both sides of the entry to ensure that one is readily visible from behind ventilation curtains; ensure that when breakthroughs are made that employees do not travel in the immediate area downwind from the breakthrough; and routinely observe work habits of miners to ensure that miners do not travel or work beyond the last row of permanent roof supports. Management should stress to all employees the critical importance of this safety standard.

2. Causal Factor: An area of roof approximately 16 feet long and 21 feet wide was left unsupported in the 3-Right cut. The working face of entry No. 4 (cut No. 7) mined into this unsupported area causing the fatal fall of roof to occur. The following potential factors may have contributed to the breakthrough into the unsupported area:

- a) The roof bolter operators were unable to completely install all of the roof bolts in 3-Right cut due to an accumulation of water on the right (down-dip) side of the crosscut, which left the area of unsupported roof where the fatal accident occurred.
- b) Prior to mining in entry No. 4 (cut No. 7), the continuous mining machine operator spoke with the roof bolter operators and understood them to say that the face of entry No. 3 (cut No. 4) was not completely roof bolted. Based on this discussion, the continuous mining machine operator thought that 3-Right cut (cut No. 3) was supported. The roof bolter operators thought they told the continuous mining machine operator that they had left 3 or 4 rows of roof bolts out of the face of 3-Right cut (cut No. 3), and that the face of No. 3 entry was not completely bolted. This miscommunication contributed to the breakthrough of entry No. 4 into the unsupported area of 3-Right cut.
- c) The section foreman did not return to 3-Right cut prior to the breakthrough to determine that the cut had been supported as required.

Corrective Action: The mine operator should develop procedures and means to assure that a working face is not mined through into an unsupported area of active workings. These should include: requiring a visual examination to confirm that the area to be mined into is supported prior to breakthrough; training employees on the use of "repeat backs" during critical conversations such that the listener repeats back the information and it is confirmed by the speaker (training should include the theory behind effective communications and the ways that using repeat backs can improve performance); and developing a system to address unusual conditions in unbolted places, so that unsupported areas can be roof bolted on cycle.

### CONCLUSION

The direct causes of the fatal accident were traveling in an area of unsupported roof and management's failure to ensure that the area was roof bolted prior to mining into the unsupported area. Contributing causes included failure to completely bolt the unsupported area (3-Right cut) on cycle, due to water accumulations in the face, and miscommunications regarding the presence of the unsupported roof where the accident occurred. Two possible contributing causes exist depending on Orton's route of travel into 3-Right cut. One was the extra roof warning device located approximately 20 feet outby the last row of roof supports, which potentially caused confusion and complacency as to the actual location of the end of roof supports. The second was the lack of a visible roof warning device when approaching on the ventilation curtain side of the place.

Approved by:

**ORIGINAL SIGNED BY**  
**BOB E. CORNETT, FOR**  
Allyn C. Davis  
District Manager

**OCTOBER 3, 2005**

Date

## ENFORCEMENT ACTIONS

Order No. 7623289 was issued to South Central Coal Company under the provisions of Section 103(k) of the Mine Act:

The mine has experienced a fatal roof fall accident on the 1<sup>st</sup> South, MMU 002-0. This order is issued to assure the safety of any person in the coal mine until an examination or investigation is made to determine that underground working sections are safe. Only those persons selected from company officials, state officials, the miner's representative and other persons deemed by MSHA to have information relevant to the investigation may enter or remain in the affected area.

Citation No. 7636841 was issued to South Central Coal Company under the provision of Section 104(d)(1) of the Mine Act for a violation of 75.203(d).

On June 6, 2005, at approximately 11:05 p.m., entry No. 4 working face was mined into the unsupported working place of 3-Right (crosscut No. 4 between entry Nos. 3 and 4, in MMU 002-0), on the 1<sup>st</sup> South working section. A fall of roof occurred in the unsupported working place of 3-Right, which struck and fatally injured an electrician who was in the unsupported area.

Citation No. 7636842 was issued to South Central Coal Company, under the provision of Section 104(a) of the Mine Act for a violation of 75.202(b).

On June 6, 2005, at approximately 11:05 p.m., an electrician traveled approximately 12 feet inby unsupported roof in 3-Right (crosscut No. 4, between entry Nos. 3 and 4, in MMU 002-0), in the 1<sup>st</sup> South working section; and was struck and fatally injured by falling roof material that measured approximately 8 feet long, 4.5 feet wide, and 4 to 19 inches thick.

Citation No. 7636843 issued to South Central Coal Company under the provision of Section 104(a) of the Mine Act for a violation of 75.362.

On June 6, 2005, at approximately 11:05 p.m., an electrician traveled approximately 12 feet inby unsupported roof in 3-Right (crosscut No. 4, between entry Nos. 3 and 4), in the 1<sup>st</sup> South working section; and was struck and fatally injured by falling roof material. The 3-Right cut area was examined by the section foreman at 8:36 p.m., prior to the accident, and the foreman recorded a hazardous

condition that "3R" (cut No. 3 as shown on Appendix B in accident report) was "not bolted." Following this examination, the roof bolters entered cut No. 3 to bolt, but left the last 16 feet of the cut unbolted due to an accumulation of water at the face. The entry No. 4 working face was later mined into this unsupported area causing the fatal roof fall to occur. Due to the hazardous condition noted and the accumulation of water at the "3R" (cut No. 3, 3-Right) face, an additional examination for safety purposes should have been made to check for correction of the hazardous conditions prior to the breakthrough into the unsupported area. This additional examination was not made.

Citation No. 7636844 issued to South Central Coal Company under the provision of Section 104(a) of the Mine Act for a violation of 75.208.

On June 6, 2005, at approximately 11:05 p.m., an electrician traveled approximately 12 feet inby unsupported roof in 3-Right (crosscut No. 4, between entry Nos. 3 and 4, in MMU 002-0), in the 1<sup>st</sup> South working section; and was struck and fatally injured by falling roof material. The end of permanent roof support in 3-Right was not posted with a warning device which was readily visible when approaching the end of support on the right side of the entry from behind the ventilation line curtain. A warning device was posted on the left side of the entry on the next to last row of roof bolts, but this device was not readily visible from behind the ventilation curtain. In addition, a second warning device was installed on the left side of the place, five rows outby the last row of permanent roof supports. Other areas on the 1<sup>st</sup> South section, as listed below, contained warning devices where the roof was permanently supported (roof bolted):

- a. Entry No. 1, between crosscut Nos. 2 and 3.
- b. Entry No. 2, between crosscut Nos. 2 and 3.
- c. The intersection of entry no. 2 and crosscut No. 3.
- d. Crosscut No. 3, between entry Nos. 3 and 4.

These devices were not removed after the places were permanently supported with roof bolts. Failure to remove these devices defeats the intent of the regulation, promotes complacency, and provides a false impression as to where the end of permanent roof support is located; thereby not accurately warning miners where unsupported roof exists.

## APPENDIX A

### List of Persons Participating in the Investigation

#### **SOUTH CENTRAL COAL COMPANY, INC.**

Bobby G. Meadows, Jr.	President
Timothy Ball	Vice President
Willard Deel	Section Foreman
Larry C. Carpenter	Continuous Mining Machine Operator
Jason Schafer	Right Side Roof Bolter Operator
Troy Rowland	Left Side Roof Bolter Operator
Johnathan Easley	Shuttle Car Operator
Glen Clyma	Shuttle Car Operator
Samuel Ortiz	Scoop Operator

#### **STATE OF OKLAHOMA DEPARTMENT OF MINES**

Roy E. Tackett	Mine Inspector
Kevin Woody	Reclamation Inspector 3
Mike Darneal	Mine Inspector 1

#### **MINE SAFETY AND HEALTH ADMINISTRATION**

Jeff Fleshman	Mining Engineer
Billy D. Owens	Supervisory Mining Engineer
Paul L. Tyrna	Mining Engineer/Geologist
David L. Weaver	Supervisory Training Specialist
Joseph C. Zelanko	Supervisory Mining Engineer

# APPENDIX B

FATAL ROOF FALL ACCIDENT  
SOUTH CENTRAL MINE (ID NO. 34-01787)  
SOUTH CENTRAL COAL COMPANY, INC.  
SPIRO, LE FLORE COUNTY, OKLAHOMA  
JUNE 6, 2005

## AFTERNOON SHIFT CUT SEQUENCE

# Afternoon Shift Cut Sequence

1 – turn cut in 3-Right

2 – 2-Left

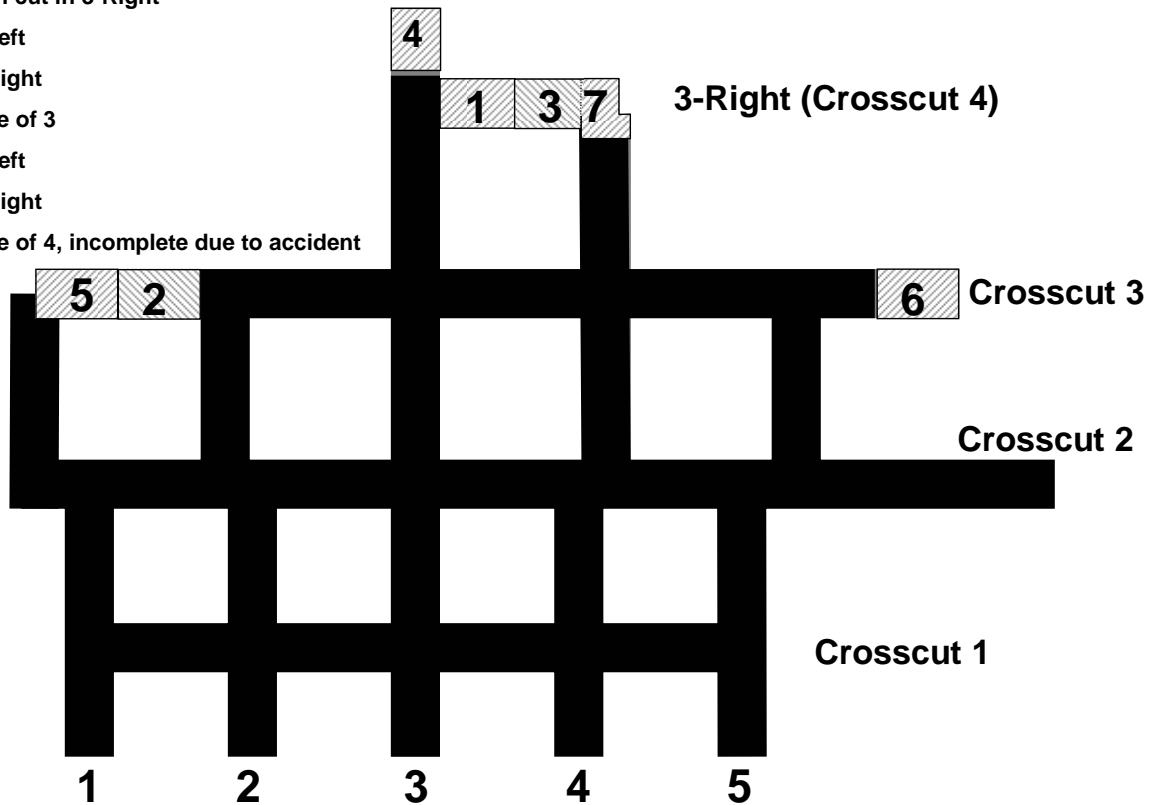
3 – 3-Right

4 – face of 3

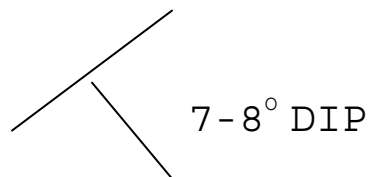
5 – 2-Left

6 – 5-Right

7 – face of 4, incomplete due to accident



NOT TO SCALE

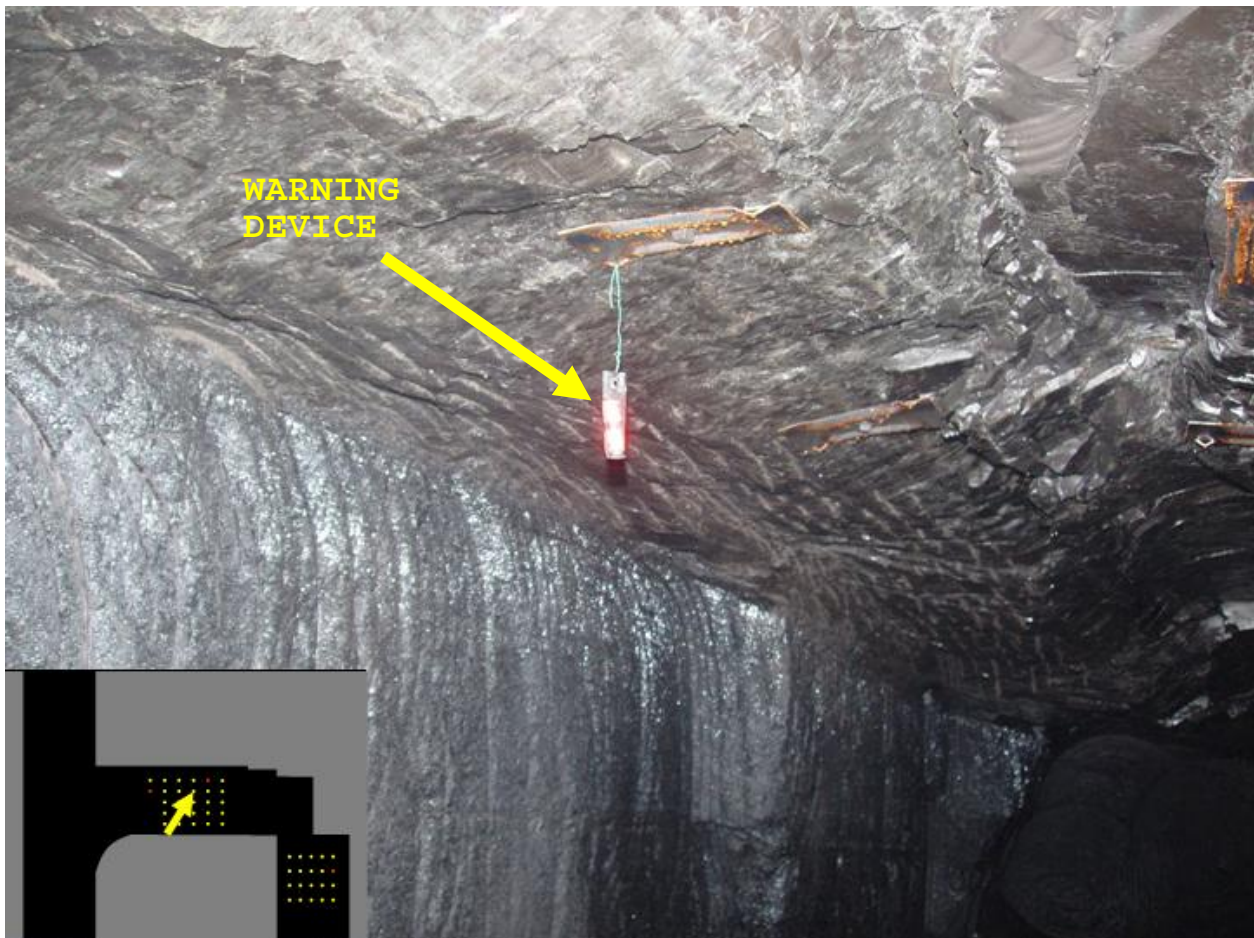




## APPENDIX C

FATAL ROOF FALL ACCIDENT  
SOUTH CENTRAL MINE (ID NO. 34-01787)  
SOUTH CENTRAL COAL COMPANY, INC.  
SPIRO, LE FLORE COUNTY, OKLAHOMA  
JUNE 6, 2005

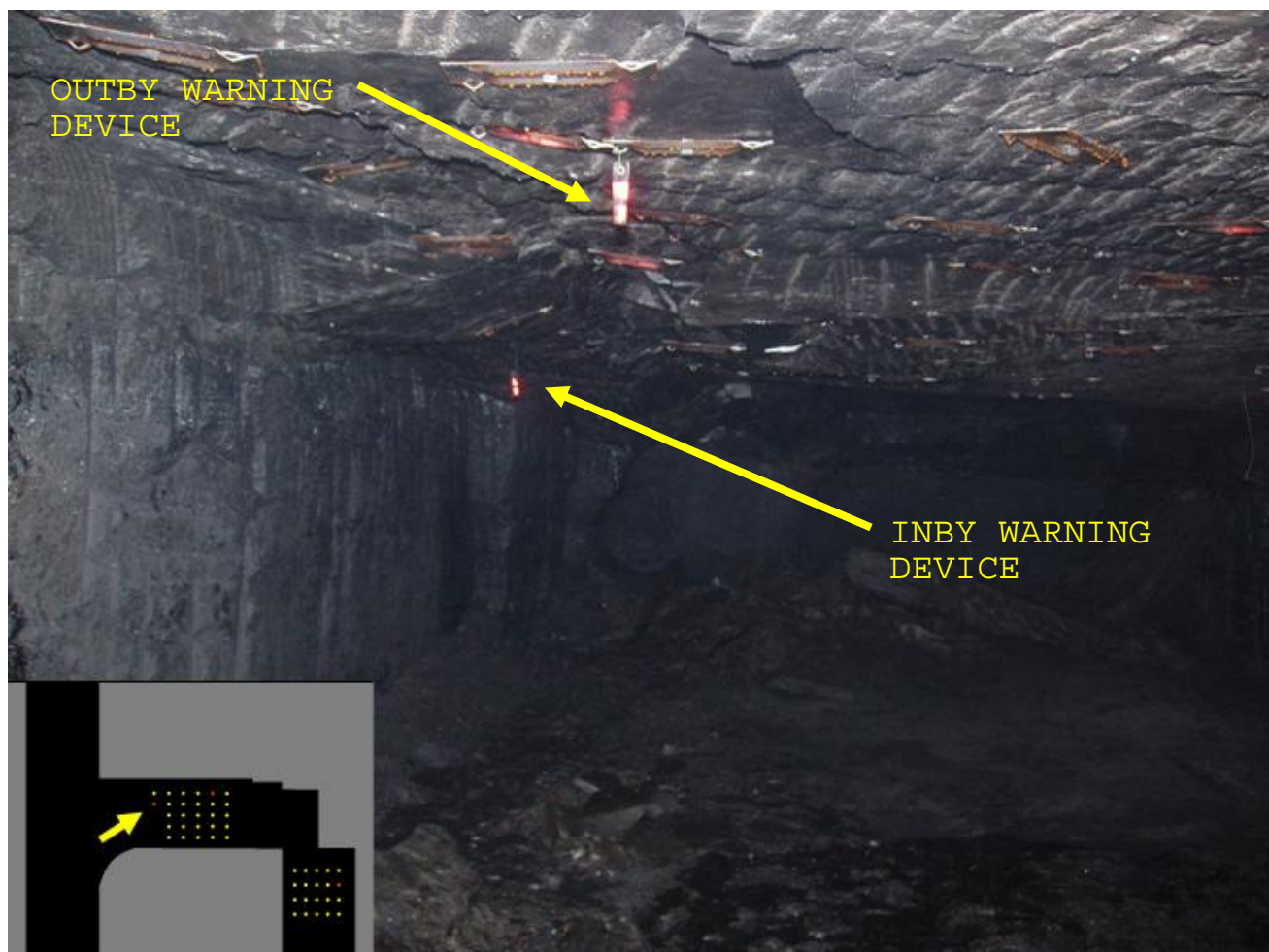
**PICTURE OF ROOF WARNING DEVICE ON NEXT  
TO LAST ROW OF BOLTS AT ACCIDENT SITE**



## APPENDIX D

FATAL ROOF FALL ACCIDENT  
SOUTH CENTRAL MINE (ID NO. 34-01787)  
SOUTH CENTRAL COAL COMPANY, INC.  
SPIRO, LE FLORE COUNTY, OKLAHOMA  
JUNE 6, 2005

### PICTURE OF ROOF WARNING DEVICES AT ACCIDENT SITE



## APPENDIX E

FATAL ROOF FALL ACCIDENT  
SOUTH CENTRAL MINE (ID NO. 34-01787)  
SOUTH CENTRAL COAL COMPANY, INC.  
SPIRO, LE FLORE COUNTY, OKLAHOMA  
JUNE 6, 2005

### SKETCH OF 1<sup>ST</sup> SOUTH SECTION AND ROOF WARNING DEVICES

