

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Surface Mine

Fatal Fall of Highwall
November 20, 2004

at

Red Cedar Surface Mine
Endurance Mining
Clothier, Boone County, West Virginia
ID No. 46-08683

Accident Investigator

Sherman L. Slaughter
Coal Mine Safety and Health Specialist

Originating Office
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Jesse P. Cole, District Manager

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OVERVIEW

At 2:05 a.m., on Saturday, November 20, 2004, a 41-year old equipment operator with seven months of mining experience was fatally injured at Endurance Mining's Red Cedar Surface Mine. The accident occurred while he was operating an excavator near the highwall loading spoil into trucks. The excavator was positioned with the cab on the highwall side. The highwall collapsed causing rocks to cover the operator's cab. It took approximately eight hours to recover the victim from the cab of the machine.

The mine plan established by the mine operator failed to provide for safe control of the highwall and safe working conditions.

GENERAL INFORMATION

The Red Cedar Surface Mine, Independence Coal Company dba Endurance Mining, is located near Clothier, Boone County, West Virginia. This company began operating the mine in June of 2002. The mine has two, 10-hour, production shifts a day, five days per week and every other Saturday.

The company utilizes contour mining to remove coal from the 5 Block, Upper Clarion, Middle Clarion, Lower Clarion, Stockton, and Coalburg seams. A DM 45 Ingersoll Rand track mounted drill is used to drill the overburden for blasting. Two Caterpillar D11 tractors (bulldozers) are used to push the blasted material on the benches. A Terex O&K model RH120-E excavator with a 19 cubic yard bucket is used to load the blasted overburden into two Caterpillar 785 (150 ton) rock trucks, which haul the material to the fill area. A Caterpillar D10 bulldozer is used to work the fill.

The extracted coal is hauled from the mine by truck to a nearby load out at Jacks Branch. The average daily production is approximately 6,000 tons of raw coal. The mine produces approximately 650,000 tons of raw coal annually.

The principal officers for the mine at the time of the accident were:

Art Hale Senior Mine Manager
Tommy Ellison Superintendent
Robert Brooks General Mine Foreman
Chris Brown Mine Foreman
Bryan Petrosky Safety Director

Prior to the accident, the Mine Safety and Health Administration (MSHA) completed the last regular safety and health inspection on June 29, 2004. The Non-Fatal Days Lost (NFDL) injury incidence rate for the mine in 2003 was 0.00 compared to a National NFDL rate of 1.87.

DESCRIPTION OF ACCIDENT

At about 3:30 p.m. on November 19, 2004, Christopher S. Brown, evening shift foreman, arrived at the mine office. At about 3:45 p.m. he left the office to make a pre-shift examination of the pit areas and haul roads where work would be performed during the on-coming shift. He traveled in his truck to Pit UCL 43 (Pit 43) where he examined the pit. The day shift had been loading spoil material from a binder shot that was detonated above the Middle Clarion coal seam. Because this work was not completed, the spoil remaining from the binder shot needed to be loaded out at the beginning of the evening shift. One section of unstable highwall existed in the pit which had been bermed off to prevent access.

At about 4:30 p.m. Brown traveled to Pit UCL 42 (Pit 42) where he saw that the overburden above the Upper Clarion coal seam had been blasted during the day shift. About 25 vertical feet of newly developed highwall was exposed from the top of the shot material to the 5 Block coal seam, which was 71 feet above the Upper Clarion coal seam. Looking up from the pit floor, Brown examined the 1000-foot long pit from two different locations, while it was still daylight. He

saw a few fractures in the highwall, but nothing that indicated to him the existence of old mine works.

At about 4:50 p.m., Brown arrived at the parking lot to meet the on-coming crew and gave them their work assignments. The crew consisted of Kevin Lupardous (excavator operator/victim) and Carl Sawyers, Harvey Hanshaw, Leonard Combs, Ritchie Kaughman, Paul Williams, and Ronald Halley (mobile equipment operators).

Upon reaching their assigned work area, Lupardous (victim) operated the excavator in Pit 43 to load the remaining spoil from the binder shot into rock trucks operated by Williams and Halley. At about 8:00 p.m., they moved this equipment to Pit 42 and began loading overburden material. Brown made an examination of the highwall in Pit 42 at that time, but did not note or report any hazardous conditions.

Kaughman and Combs were operating bulldozers to move overburden material out from the highwall toward the valley fill. Another bulldozer, operated by Hanshaw, was working on the valley fill where the trucks were dumping. Combs got out of the bulldozer once during a lunch break and looked at the highwall but did not note any safety hazards. Brown examined the work area in Pit 42 at 10:40 p.m. and had no safety concerns. Brown re-examined the work area in Pit 42, utilizing a spot light, at about 1:36 a.m. The examination book did not reflect that any hazards had been detected. Brown then left the pit to get parts for a bulldozer.

Shortly before 2:00 a.m. Lupardous told Combs by way of radio to clean spillage off of the pit floor where the trucks were backing toward the excavator for loading. Combs trammed off of the spoil bank onto the pit floor and began pushing the spillage toward the spoil bank. He was pushing directly in front of Halley's truck which was being loaded by the excavator.

Lupardous had loaded two buckets of spoil into Halley's truck and was digging against the wall when at approximately 2:05 a.m. rocks began to fall out of the highwall. Halley saw in his truck mirror two basketball size rocks fall out of the highwall and heard a loud crash. Halley immediately pulled his truck away from the highwall.

Halley attempted to contact Lupardous by radio, but did not get a response. Halley ran to the pad and saw that the cab of the excavator had been crushed with large rocks that had fallen out of the highwall. Combs positioned the bulldozer lights facing the excavator so they could see. Williams radioed Brown for help. When Williams and Kaughman arrived at the excavator the victim was

found trapped in the operators cab. They were unable to free him, but Kaughman, an Emergency Medical Technician (EMT), checked the victim for vital signs. No vital signs were detected. Brown, who had just returned with the bulldozer parts, began reporting the accident to other company officials. Upon arrival, Dennis Craddock, EMT, also checked the victim but could not detect any vital signs.

Due to the amount of rock on and around the machine, the recovery process lasted approximately eight hours. The victim was removed from the machine at 10:00 a.m. on November 20, 2004. The victim was pronounced dead by Jeff Frame, Paramedic, at 3:05 a.m. on November 20, 2004. Boone County Emergency Medical Services transported the victim from the mine to the Medical Examiners Office at South Charleston, West Virginia.

INVESTIGATION OF THE ACCIDENT

The MSHA field office, located in Madison, West Virginia, was notified of the accident at 2:55 a.m., on Saturday, November 20, 2004. MSHA accident investigators were immediately dispatched to the mine. A 103(k) order was issued to insure the safety of all persons at the mine. The investigation was conducted in cooperation with the West Virginia Office of Miners' Health, Safety, and Training (WVMHST), with the assistance of the mine operator and employees (refer to Appendix A for a list of persons who participated in the investigation).

The investigation team traveled to the accident scene to conduct an investigation of existing physical conditions. Photographs and relevant measurements were taken. The accident site was surveyed and drawings made. Interviews were later conducted at the mine operator's office with persons who had knowledge relevant to the accident. The on-site portion of the investigation was completed on January 31, 2005.

DISCUSSION

Equipment

The Terex O&K RH 120-E (No. EX 1801) Hydraulic Excavator (SN 37208549) being operated by the victim at the time of the accident, was a crawler unit equipped with two water-cooled diesel engines and a backhoe attachment with a 19.6 cu. yd. rock bucket. The operator's cab was located on the left side of the boom and was equipped with a falling object protective structure (FOPS), approval DIN ISO 3449. The maximum digging depth is 20'4", the maximum

digging height was 46'3", and the maximum digging reach is 49'10" measured from the center of the swing mechanism. Xenon working lights were mounted on the superstructure. There were no lights mounted on the boom. The excavator was used for production loading at this mine for about six months prior to the accident.

Accident Scene

The accident occurred in Pit 42, where the excavator was being operated from a pad located approximately 10 feet above the Upper Clarion seam. A bench at the 5 Block seam level was located 61 feet above the excavator pad. The height of the highwall above the 5 Block bench was approximately 35 feet and the bench was approximately 15 feet wide.

The mine map showed that abandoned mine workings from Long Branch Energy's Mine No. 10A (MSHA I.D. No. 46-07063) were located in the Upper Clarion Coal seam along the entire length of the highwall. The map indicated that the abandoned mine entries and crosscuts were developed on 70-foot centers and that secondary mining occurred in most of the old works. In particular, pillars had been removed from an area starting about 200 feet west, and extending 1,000 feet east of the highwall failure. Farther to the west, there was about 500 feet of the highwall where the pillars had been left in place. Pillars were also shown removed from areas of Pit 43 and Pit 44 where the highwall was developed.

Previous surface mining in the active mining areas at the Upper Clarion level intersected old works in Pits 44 and 43. In Pit 43, the highwall broke out and fell into the pit at several locations. Brown and the equipment operators observed roof bolts being loaded out with the overburden. As mining continued toward the accident site, the location and orientation of the highwall became parallel to an old underground mine entry. The highwall contained fractured strata and cracks resulting from the collapse of three abandoned underground crosscuts and an entry near the accident site.

West of the accident site, the highwall was generally in good condition. Remains of pre-split drill holes were visible along most of the highwall west of the fall in Pit 42. East and west of the accident site, arch-shaped cracks were observed on the highwall in several locations. The arch-shaped cracking and broken rock appeared to be the result of subsidence from the old underground mine workings.

Immediately east of the accident site, the highwall was rough with more broken rock, cracking and faulting or jointing. The rock was more stratified with

horizontal discontinuities along the strata, which consisted of layers of sandstone and shale. The pre-split drill holes could not be seen over large areas of this portion of the highwall.

Failure of the rock at the accident site appeared to have been through a combination of existing cracks and discontinuities, as well as subsidence induced fractures. The existing discontinuities on the west side appeared to be from a joint which had some brownish staining and was relatively smooth. The brownish staining suggests that the joint had been open long enough to allow weathering of the rock. The rock in the center and eastern side of the failure was more broken, noticeably rougher with more undulations along the break, and more splitting along the stratification.

The cab of the excavator was approximately 15 feet from the wall before the failure. The tracks of the excavator were parallel to the highwall. The excavator body was rotated 20 degrees from parallel with the excavator boom closer to the wall. The excavator cab was positioned on the highwall side of the excavator body. The proximity of the excavator from the wall and the length of its boom indicated that the excavator was not being operated perpendicular to the highwall at the time of the accident.

Method of Mining

In Pit 42, the mining cuts were being taken in two lifts. After the overburden was shot for each lift, bulldozers pushed the shot material from the bench to the valley fill (spoil pile). The excavator worked at the face of the shot bank loading overburden into the haul trucks.

The excavator and bulldozers were used to scale the highwall as overburden was removed. If hazardous material was identified above the working level of the bulldozers, they would ramp overburden material up on the highwall to get to the loose area. Smaller excavators were used to scale the top of the highwall when access was available. Access was not available at the accident site.

The excavator started loading overburden material in Pit 42 near the outer edge of the pit, and loaded across the face of the shot bank towards the highwall before the accident occurred. The excavator was positioned on a pad approximately eight feet off of the pit floor. The pit floor was approximately two feet above the Upper Clarion coal seam, due to a cap which was left to protect the coal seam. The trucks were waiting to be loaded (staging) at the outside of the pad away from the highwall to load.

Normally, the excavator was used with the operator's cab positioned away from the highwall, towards the outer edge of the pit, as it loaded across the face of the

shot bank towards the highwall. However, when the working pad was pulled at the base of the wall, the excavator typically rotated 180 degrees to place the operator's cab against the wall. This exposed the operator to any existing hazardous highwall conditions. The excavator was in this position loading a truck when the highwall collapsed, completely destroying the cab.

Brown cautioned the workers to be aware of the highwall conditions. Highwall safety was the topic of a safety meeting held on November 16, 2004. He and the victim had discussed the excavator cab position when pulling the pad at the base of the wall. They had previously tried pulling the pad at the base of the wall with the cab positioned to the outside, away from the wall. Brown believed the excavator operator could not see the wall and trucks well from this position. Brown and Lupardous decided that another machine might be the answer. It was not necessary, however to pull the pad in this manner. Other mine operators utilizing production excavators pull the pad in a manner that keeps the operator's cab positioned away from the highwall.

Examination

When Brown examined Pit 42, the face of the highwall was smooth and looked good. The other workers agreed that the highwall in Pit 42 where the excavator was working looked good. Brown determined the presence of underground workings by the appearance of the highwall. He indicated that if underground workings were present, the highwall would appear broken, with broken rock and changes in the strata. Also, when the coal was removed by surface mining, the underground mine openings would exist in the highwall. If he found these conditions he would barricade the area.

Williams did not notice indications of old works in the area where the accident occurred. Typically, he identified old works as sags in the highwall and voids when material was loaded out. Combs identified the presence of old works by crumbling of the highwall, surface cracks, overhanging rock, and exposed holes in the wall. Halley would watch for voids as the overburden was removed to determine if old underground works existed.

The crew in Pit 42 had examined the highwall before dark. None of the crew observed conditions that would indicate the presence of old works to them where the accident occurred. At that time, the conditions indicating the old works were covered by the shot material, which had not been loaded out.

As the shot material was loaded out from against the highwall, the presence of fractures or broken rock was an indication of the old mine works. Brown examined the highwall at 10:40 p.m. and at 1:36 a.m. He used a spot light to

check the highwall as he made the examinations after dark. Brown did not associate the highwall conditions with the presence of old works. The highwall condition noted during the examination did not indicate the existence of second mining. He stated that the victim, prior to the accident, did not make any comments about the highwall and did not indicate there were any problems with the condition of the wall.

Due to a lack of access, the section of highwall located above the 5 Block bench could not be examined. The bench was inaccessible for inspection due to material from above sliding onto the bench or loss of the bench. These conditions made it nearly impossible to inspect the section of highwall above the 5 Block bench.

Robert Brooks, General Mine Foreman, checked the pits daily and sometimes on the evening shift. Charlie Scott, day shift foreman, and Brown were the certified persons designated by the operator to make the on-shift examinations for hazardous conditions.

Illumination

The workers said that they could see the highwall with their equipment mounted lights. There was no other source of light in the pit. Brown used a spotlight to illuminate the highwall during his examination to enable him to see the highwall. For the equipment operators to see the highwall after dark, it would be necessary to have the equipment mounted lights directed at the specific area of the wall being examined.

Brown had previously seen areas at the mine where extensively broken rock indicated the presence of underground mine workings. The strata change and fractures in the highwall rock located immediately west of the accident site, which was observed when he conducted his examinations, was fractured to a lesser degree than was normally encountered. Both Brown and the crew described these highwall conditions as good. Removal of spoil was required to expose the highwall, enabling Brown to observe it's condition.

The strata change and fractures that indicated the old works were located near the pit floor and became observable as the spoil was removed. The trucks parked away from the highwall and parallel to it when waiting to load. They backed towards the wall when positioning for loading. The lights from the trucks would have illuminated the highwall where the old works existed for a very short period of time, if at all, after the spoil was loaded out. The victim would have been able to see the indications of the existing old works as he loaded the spoil out from near the highwall.

Mine Plan

The mine operator's engineering group, operations group, Senior Mine Manager, and Superintendent held meetings to discuss the mine plan. The engineering group developed the mine plan consisting of maps showing the cut layouts, machinery sequencing, and mining projections for one year on a monthly basis. The maps showed all underground workings within the projected mining area. The operations group determined the method of mining. The established mining plan was being followed at the mine where the accident occurred.

Brown could not recall seeing any old works shown on any map. Brown did not know where the old works were located prior to mining. The highwall drill operator told Brown about drilling into mine voids in Pit 43 and surface mining had been done through some old entries in that area. A week before the accident occurred, Brown's crew mined into an old underground mine entry in the Lower Clarion coal seam.

Where the old works existed in the Upper Clarion coal seam, subsidence had occurred in the overlying strata due to the previous mining of the pillars. Where highwall development in Pits 42, 43, and 44 intersected the unstable strata overlying these old works, the face of the highwall was not stable. Highwall failure had occurred in some of the areas of Pits 43 and 44. One area had been barricaded in Pit 43 and a report of the condition was entered into the daily and on-shift report as a hazardous condition.

Brown did not communicate with the engineering group about the old works. Brown would not report the presence of old works if he saw two or three entries showing in the highwall. If he saw as many as seven or more he would report them because he believed that their existence could cause a problem. There were no procedures in place to change mining methods where old works were known to exist or encountered when surface mining.

The mine operator did not establish procedures for addressing the presence of old works. If subsidence resulting from the old works caused highwall failure, the area was barricaded or the fallen material was loaded out, but the mine plan did not change.

The ground control plan in effect for the mine at the time of the accident had been received by MSHA on January 8, 2003. It required that a minimum 20-foot wide bench be left at the 5 Block coal horizon. As the overburden was drilled and the highwall was developed in Pits 42, 43, and 44, the pre-split blast holes were located to leave a bench where required by the ground control plan. In

some areas of the pits where the old works existed, portions of the bench were either shot out when the area was blasted, had fallen out after the highwall was developed, or were removed as the highwall was cleaned. Significant highwall failure occurred when the bench fell out. Subsidence induced cracks and fractures were evident in the highwall in the areas where the bench had fallen out. The ground control plan did not establish any procedures, precautions, or provisions to be taken where the old works intersected and/or were located adjacent to the active surface mining areas at the mine.

Brown said he had not received any special training relating to the hazards presented by surface mining where old works existed. He had not discussed the existence of old works with the engineering group and there were no procedures in place to inform the production workers about their existence.

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic causes of the accident that were correctable through reasonable management controls. During the analysis, causal factors were identified that, if eliminated, would have either prevented the accident or mitigated its consequences.

Listed below are causal factors identified during the analysis and their corresponding corrective actions implemented to prevent a recurrence of the accident:

1. *Causal Factor:* Most of the highwalls in Pits 42, 43, and 44 were developed where abandoned underground mine workings of the Upper Clarion coal seam exist. The highwalls were not stable due to subsidence induced by second mining of these abandoned mine workings.

Corrective Action: The mine operator revised the ground control plan for the mine on December 3, 2004. This change modified the mine plan to require that drilling procedures be implemented where contour mining occurred adjacent to old underground mine works. The revised plan also required a bench to be left above the pit floor located away from the outermost edge of old underground mine works. This resulted in highwall development away from the old mine workings to prevent subsidence from affecting the stability of the highwall.

2. *Causal Factor:* The ground control plan did not establish procedures, precautions, or provisions to be taken for the safe control of the highwall and safe working conditions. Specifically it did not insure highwall

stability in the contour cuts where old works intersected and/or were located adjacent to the active surface mining areas at the mine.

Corrective Action: The mine operator revised the ground control plan for the mine on December 3, 2004, to safely control the highwalls and to provide safe working conditions for persons working near highwalls. The plan revision addressed highwall stability in the contour cuts where old works intersected and/or were located adjacent to the active surface mining areas at the mine.

3. *Causal Factor:* The procedure used by the excavator when pulling the pad positioned the operators cab on the highwall side, exposing the operator to a hazardous highwall condition.

Corrective Action: The mine operator revised the ground control plan for the mine on December 3, 2004, to prevent highwall material from striking the operators cab.

CONCLUSION

The accident occurred because the ground control plan did not provide for safe control of the highwall and safe working conditions in areas near abandoned underground mine workings. Subsidence resulting from the second mining of the abandoned underground mine workings caused the highwall to be unstable. The unstable highwall collapsed crushing the machine operators cab and resulted in the death of the machine operator. At the time of the accident, the operator's cab was positioned immediately adjacent to the highwall while the pad was being excavated. This was the normal procedure for excavator positioning.

The mine plan established by the mine operator failed to provide for safe control of the highwall and safe working conditions.

Approved By:

ORIGINAL SIGNED BY

Jesse P. Cole
District Manager

AUGUST 12, 2005

Date

ENFORCEMENT ACTIONS

1. A 103(k) Order No. 7214012 was issued to Endurance Mining on November 20, 2004, to ensure the safety of persons at the mine until an investigation of the accident could be completed.
2. A 104(d)(1) Citation No. 7214033 was issued to Endurance Mining for a violation of 30 CFR 77.1000, stating in part, that the operator did not establish and follow a ground control plan for the safe control of all highwalls that was consistent with prudent engineering design and insured safe working conditions. The highwall developed in the Upper Clarion and Lower Clarion mining pits at this mine was developed where second mining had occurred in old underground mine workings underlying and adjacent to the area where the highwall was developed. The mining methods employed by this operator did not insure highwall stability in these locations.
3. A 104(d)(1) Order No. 7214034 was issued to Endurance Mining for a violation of 30 CFR 77.1006(a), stating in part, that the operator of the Terex O&K RH 120-E excavator (No. EX 1801) was working near a dangerous highwall on November 20, 2004. The unstable highwall collapsed crushing the cab of the machine and resulting in fatal injuries to the excavator operator. The victim was loading spoil into rock trucks near the approximately 61 ft. highwall in the UCL 42 pit on the Upper Clarion level at the mine. When the excavator loaded out the spoil against the highwall and turned to pull the pad, the operator's cab was positioned on the highwall side of the pad between the boom of the machine and the highwall. The cab was located approximately 15 feet from the highwall when the highwall collapsed. Subsidence resulting from second mining in the old underground works caused this highwall to be unstable.

**Appendix A
Persons Participating in the Investigation**

Endurance Mining

Michael K. SnellingSurface Mine Director
Art Hale Senior Mine Manager
Tommy Ellison Superintendent
Robert BrooksGeneral Mine Foreman
Chris BrownMine Foreman
Bryan Petrosky Safety Director
Shane Harvey.....Attorney
Frank FosterSafety Manager
John LawrenceForeman
Barry Casto..... Maintenance Superintendent
Kermit E. Fincham, Jr Chief Engineer
Chris BellomyChief Surveyor
Keith Runyon..... Senior Engineer
Leonard Combs Mobile Equipment Operator
Paul Williams Mobile Equipment Operator
Ronald Halley Mobile Equipment Operator

Terex Mining

Gary Jones Field Service Technical Manager

West Virginia Office of Miners' Health, Safety, and Training

Terry Farley..... Accident Investigator
Eugene White..... Inspector
Randall BaileySurface Inspector
Harry Linville Inspector At Large
Doug Conaway Director

Mine Safety and Health Administration

Sherman L. Slaughter Coal Mine Safety and Health Specialist
Donald T. Kirkwood.....Supervisory Civil Engineer
Eric J. Gottheld..... Civil Engineer
Jesse P. ColeDistrict Manager
Luther E. Marrs Assistant District Manager
Don Ellis Supervisory CMS&H Inspector
Vaughan Gartin..... Coal Mine Safety and Health Inspector

Appendix B

