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# GENERAL INFORMATION

## Coal Mine Fatal Accident 2004-06



Operator:	Brooks Run Mining Company, LLC
Mine:	Brooks Run Processing Plant No. 1
Accident Date:	March 2, 2004
Classification:	Sliding Material
Location:	District 4, Webster County, WV
Mine Type:	Surface
Employment:	51

# OVERVIEW

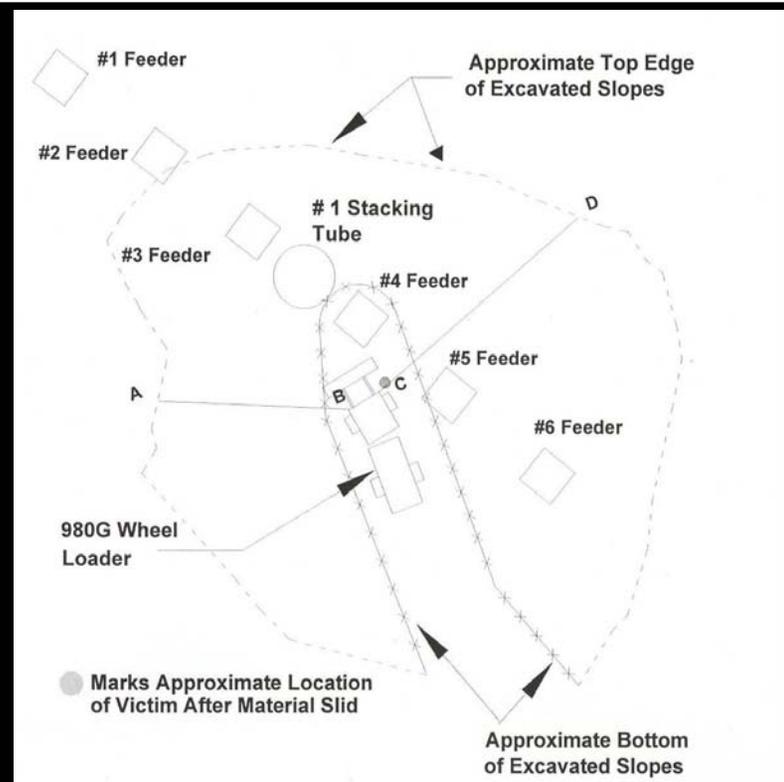
## Coal Mine Fatal Accident 2004-6 Powered Haulage



- At approximately 4:00 p.m. on Tuesday, March 2, 2004, a 50-year old Maintenance Foreman with 31 years of mining experience was fatally injured while he was directing the placement of a steel plate over the chute of an underground reclaim feeder near the toe of a coal stockpile.
- Reclaiming operations to open up the stockpile for access to the feeder caused the coal bank near the feeder to be unstable. The coal bank became unstable due to the height of the stockpile and the steepness of its slopes.
- Immediately after the plate was placed over the feeder, part of the coal bank collapsed. The victim was knocked to the ground and covered with approximately three feet of coal. It took about 30 minutes for nearby workers to uncover the victim. He was found in a face down position under the boom of the end loader but could not be revived.

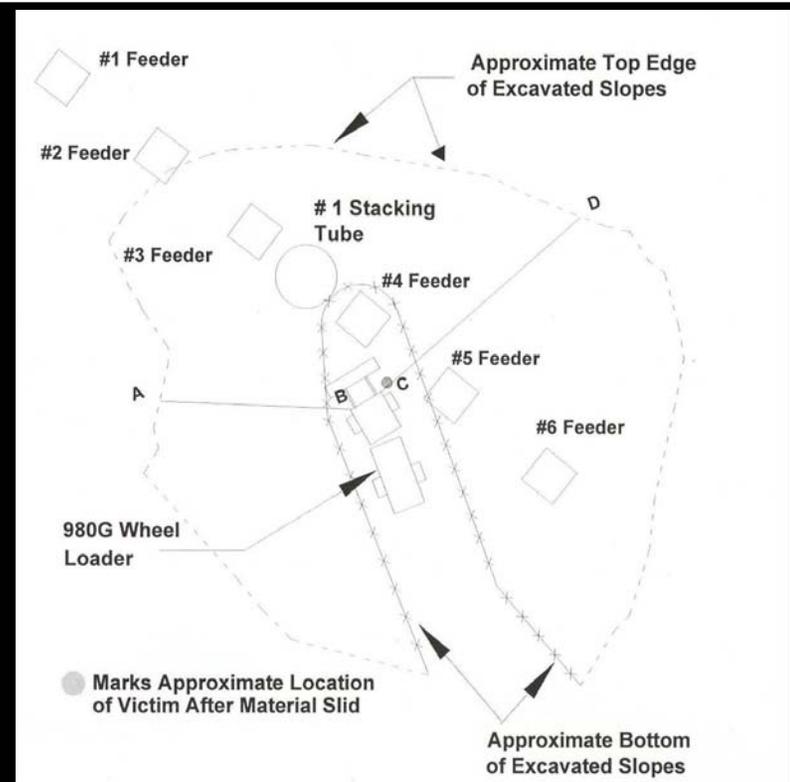
# ACCIDENT DESCRIPTION

- At the beginning of the day shift on March 2<sup>nd</sup>, a foreman and three laborers were assigned to replace the No. 4 feeder's vibratory feeder with a new mass-flow feeder.
- The No. 4 feeder was located at the meeting point of the Nos. 1 and 2 clean coal piles.
- To prepare the feeder to be worked on, the feeder was opened so that the coal above it could be loaded onto a train. Once this was done, a large area had been cleared above the feeder.
- The victim, who was also a foreman, along with another foreman, directed two employees to remove coal from the No. 1 clean coal pile and above the feeder opening to complete the cleaning process.



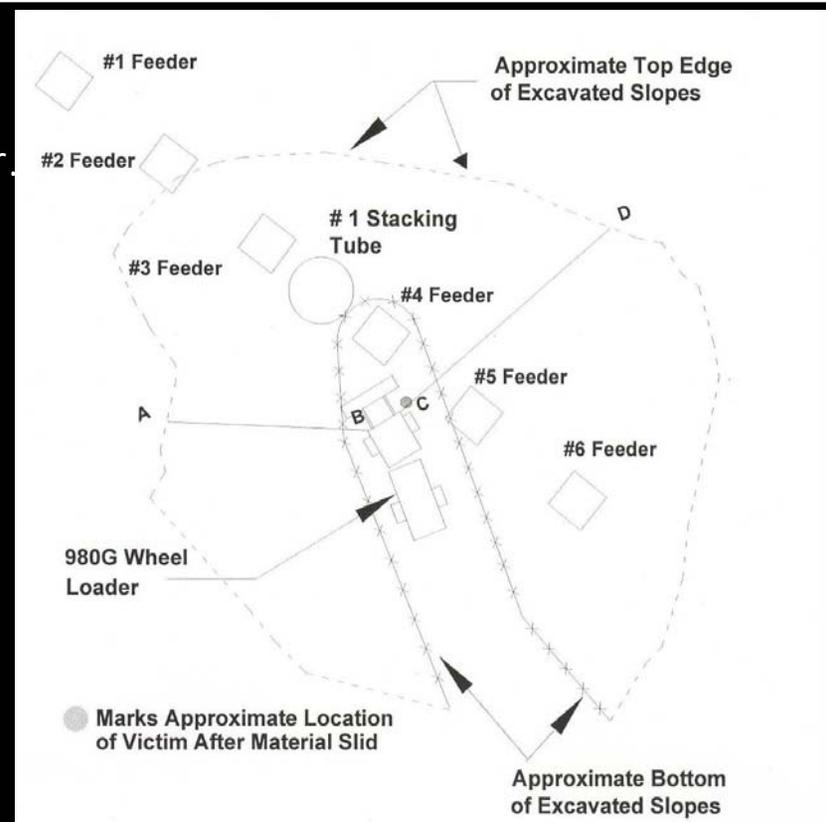
# ACCIDENT DESCRIPTION

- The victim told two laborers to bring two plates to cover the No. 4 feeder.
- As the first plate was being installed, it hit the concrete that surrounds the opening and bent.
- The plate was removed and the end loader was used to remove coal that fell from the piles onto the feeder.
- Both foremen decided that a sufficient amount of coal had been removed from above the feeder.
- The foreman who was not the victim, twice examined the steeply sloped banks of clean coal and reached a conclusion that no hazardous conditions existed.
- The victim then examined the same area, and did not discuss any hazards with anyone.



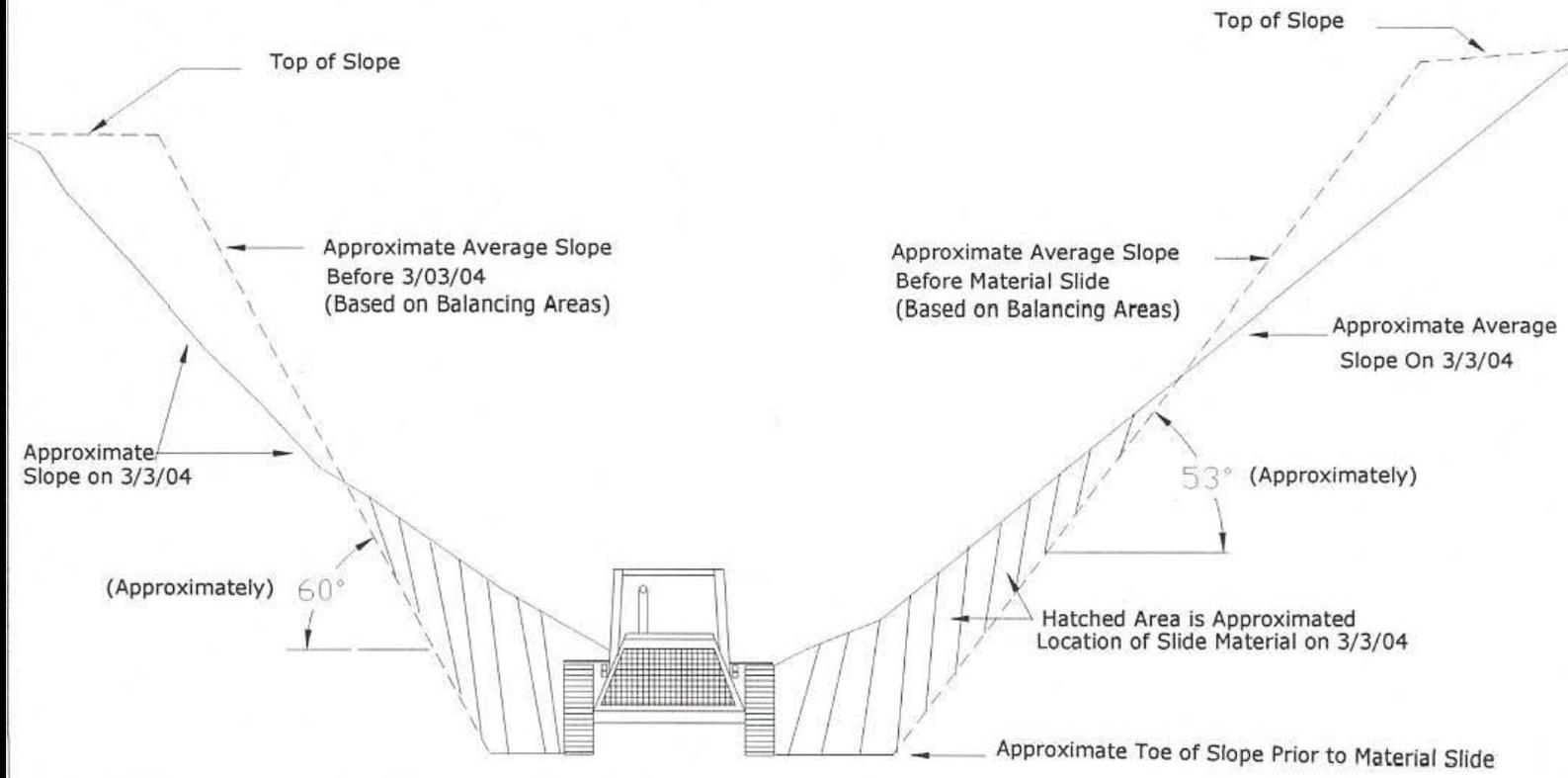
# ACCIDENT DESCRIPTION

- During the examinations, both examiners observed coal continually falling from the coal piles to the feeder.
- The decision was made to quickly install the second plate before more coal fell onto the feeder.
- An experienced bulldozer operator asked the victim to allow him to knock down one of the piles because it was obvious to him that it posed a sliding material hazard.
- The victim told him the pile was ok.
- While the second plate was being prepared for installation, the experienced bulldozer operator again asked the victim to allow him to knock down one of the piles.
- Again the victim told him that it was ok.



# ACCIDENT DESCRIPTION

- The victim positioned himself between the piles and beside the end loader to help guide the installation of the second plate.
- During this process, coal slid from one of the piles causing three feet of coal to cover the victim.
- The victim was fatally crushed under the coal.



# DISCUSSION

- The Brooks Run Processing Plant typically produces 10,000 tons of clean coal per day.
- Coal is plowed off the belt at different points, so that four separate piles of coal are formed, corresponding to four different grades of coal.
- When the coal was reclaimed from above the No. 4 feeder to gain access to place the plates over the feeder, the coal bank on the left side of the feeder towards the preparation plant was in the No. 1 Clean Coal (CC) Stockpile, while the coal bank on the right side of the feeder towards the loadout was in the No. 2 CC stockpile.
- The outside angle of the coal pile, as measured on CC stockpile No. 1 after the accident, was between 36 and 37 degrees. This was the angle of repose of the pile.
- Coal is normally reclaimed by pushing the coal with a bulldozer to chutes located at ground level above the feeders.

# FEEDERS

- There are three feeders on each side of the No. 1 Stacker tube, and two feeders on each side of the No. 2 Stacker tube. The feeders at the No. 1 Stacker tube are numbered 1 through 6, with feeders 1 through 3 located under Clean Coal Stockpile No. 1, and feeders 4 through 6 located under Clean Coal Pile No. 2.
- The purpose of the maintenance work was to replace the existing No. 4 vibratory feeder with a new mass-flow feeder. Also, deteriorated metal between the feeder and the chute was to be replaced. The existing feeder and metal components were original plant equipment, dating from 1980, and had been affected by corrosion.
- The mass-flow feeder can feed at rates of 2,500 to 3,000 tons per hour, while the vibratory feeders discharge at rates of 300 to 500 tons per hour.
- A temporary plate had been put in the chute inside the reclaim tunnel, to prevent coal from coming through the No. 4 feeder chute from the stockpile above while some initial cutting was done on the feeder.

# FEEDERS

- Additional steel plates would have to be installed above the No. 4 feeder chute on the ground, to prevent coal from coming out of the stockpile into the tunnel as the plate and the feeder were removed.
- The clean coal stockpiles were seldom reclaimed to the extent that the feeders were accessible for repair work from the top of the ground.
- On the day of the accident, a bulldozer was used to reclaim the No. 1 and No. 2 clean coal stockpiles down to near feeder level, and an end loader was used to remove the remaining coal from the feeder and widen the work area. This would allow access to perform the work of covering the feeder.
- No one discussed the hazards presented by the coal banks in the work area at the No. 4 feeder with the employees of the contractor who were working at the site when the accident occurred. No one discussed the actual procedures that would be used.

# TRAINING/INFORMATION

- The victim did not discuss the hazards presented to the workers or the work procedures to be used for placing the second plate with anyone.
- The victim chose to ignore two requests by Selman to cut the No. 2 pile down, despite Selman having more experience working with coal stockpiles than any other person at the work area.
- A plan or procedure for covering the feeder, including an analysis of the hazards involved was not developed and discussed with the workers prior to commencement of the work.
- The operator did not provide training or instruction to any of the persons at the work area in the methods used to determine stability of a coal stockpile bank.
- The operator did not use their engineering staff as a resource to obtain information that should have been used to train the workers in the procedures used to determine the stability of a bank in a coal stockpile.

# EXAMINATIONS

- One foreman determined the stockpile banks were not hazardous because there was no movement of coal off the banks on either side of the feeder.
- Actually, he did see coal slough from the bank of the stockpile in front of the feeder from around the stacker tube.
- Due to experience, the examiners at this site should have been familiar with the handling of coal stockpiles and their associated hazards.
- The approximate configuration of the stockpile was 41 feet high on the left of the feeder, with an average slope of 60 degrees, and 47 feet high on the right of the feeder with an average slope of 53 degrees.
- The angle of repose of a coal stockpile is typically 34-37 degrees which may vary according to the composition of the pile.
- The victim who was the other foreman, stated that the stockpiles looked alright.

# STOCKPILE STABILITY

- Factors that can allow a coal stockpile to stand at angles steeper than its normal angle of repose include dozer traffic on the pile and the moisture content of the coal. Traffic packs the coal tighter, while moisture can add "apparent" strength by providing surface tension.
- Anytime granular material is standing at an angle steeper than the material's angle of repose, the slope material is marginally stable and should be considered in danger of sliding.

# ROOT CAUSE ANALYSIS

Causal Factor: Work was performed in a hazardous location. The victim was working on the ground near the No. 2 clean coal storage pile, where he was exposed to the hazard of loose coal sliding from the unstable banks. This condition was developed in the stockpile by the reclaiming operations of the bulldozer and end loader while uncovering the No. 4 feeder.

Corrective Action: The company developed a "Stockpile Area Maintenance Plan" that designates work zones for persons working near any coal storage pile at the mine. The Plant supervisors use Abney Hand Levels to determine the projected toe of a pile, based on its natural angle of repose. Eighteen feet of distance is added to the projected toe to establish the work zone limit. This point on the ground is marked by cones, danger tape, or other visible means. No one is allowed to work, while on foot, between the limit of the work zone (marked by the cones, danger tape, etc.) and the toe of the coal storage pile.

# ROOT CAUSE ANALYSIS

Causal Factor: An inadequate examination was performed. The work area was examined for hazardous conditions by the certified person designated by the company to do such examinations before the victim began the work at the No. 4 feeder, near the unstable bank of the No. 2 clean coal storage pile. The certified person did not identify the unstable coal pile as a hazardous condition, report the unstable banks to anyone, and did not have the hazardous conditions corrected before persons were allowed to work in the area. Based on his experience, the examiner believed the area to be safe. However, he did not know how to determine when a bank in a coal storage pile was stable.

Corrective Action: Examiners were trained in the procedures of identifying, recording, and correcting hazardous conditions present during examinations. All certified persons, who make examinations for hazardous conditions in active working areas at the mine, received training in the procedures used to determine when a bank in a coal stockpile is stable. Those procedures identify an unstable coal bank and outline the steps to be taken to keep persons from working near such a bank.

# ROOT CAUSE ANALYSIS

Causal Factor: None of the workers exposed to the unstable banks of the No. 1 and No. 2 clean coal storage piles had received training to enable them to determine the stability of a bank in a coal storage pile (stockpile). They made the determination that the work area was safe based on their experience. The three contractor employees had minimal experience working near coal storage piles.

Corrective Action: The "Stockpile Area Maintenance Plan" developed by the company outlines procedures used to determine when a bank in a coal storage stockpile is stable. Those procedures identify an unstable coal bank and outline the steps to be taken to keep persons from working near such a bank. All the workers assigned duties on, in, or around coal storage piles at this mine received training in this plan. The plan was made a part of the mine safety program, was distributed to each employee, and posted at the mine.

# CONCLUSION

The accident resulted from failure to identify, report, and correct hazardous conditions and failure to provide required training.

Contributing to the accident was the failure to effectively communicate with the most experienced, most knowledgeable miner who was present and aware of potential hazards involving the coal pile.

# ENFORCEMENT ACTIONS

104(d)(1) Citation - two foreman and two contract laborers were permitted to stand near the steep banks of the No. 1 and No. 2 clean coal storage piles at this mine where they were exposed to sliding material hazards. Reclaiming operations produced the steep banks in the clean coal storage piles.

104(a) citation - the hazards of sliding material which were noted during examinations of the No. 1 and No. 2 clean coal stockpiles were neither reported or corrected.

# ENFORCEMENT ACTIONS

104(a) citation – foremen who were working near steep coal stockpile banks in order to install a steel plate over the No. 4 reclaim feeder opening at the mine, were not instructed in the safety aspects and safe work procedures of the task of performing maintenance and repairs on equipment near coal stockpiles specific to determining when a stockpile was stable and the procedures to be used when a stockpile was not stable.

104(a) citation - mobile equipment operators who were working near steep coal stockpile banks in order to install a steel plate over the No. 4 reclaim feeder opening at the mine, were not instructed in the safety aspects and safe work procedures of the task of performing maintenance and repairs on equipment near coal stockpiles specific to determining when a stockpile was stable and the procedures to be used when a stockpile was not stable.

# ENFORCEMENT ACTIONS

104(a) citation – a foreman and two laborers (all contractor employees), who were working near steep coal stockpile banks in order to install a steel plate over the No. 4 reclaim feeder opening at the mine, were not instructed in the safety aspects and safe work procedures of the task of performing maintenance and repairs on equipment near coal stockpiles specific to determining when a stockpile was stable and the procedures to be used when a stockpile was not stable.

104(a) citation – a foreman and two laborers (all contractor employees), who were working near steep coal stockpile banks in order to install a steel plate over the No. 4 reclaim feeder opening at the mine, were not instructed in the safety aspects and safe work procedures of the task of performing maintenance and repairs on equipment near coal stockpiles specific to determining when a stockpile was stable and the procedures to be used when a stockpile was not stable.

# ENFORCEMENT ACTIONS

104(a) citation - two contractor laborers were permitted to stand near the steep banks of the No. 1 and No. 2 clean coal storage piles at this mine where they were exposed to sliding material hazards. Their work was being directed by two foremen employed by the mine operator. Their immediate supervisor, employed by this contractor, was observing the work. Reclaiming operations produced the steep banks in the clean coal storage piles.

# BEST PRACTICES

- Evaluate each step in the work process for potential hazards before starting work.
- Train employees in established safe work procedures, then ensure that they are complied with.
- Position employees to prevent them from being exposed to hazards.
- Examine work areas during the shift for hazards that may be created as a result of the work being performed.
- Always remember: Any unconsolidated material sloped above its natural angle of repose is, by definition, UNSTABLE and potentially DANGEROUS.