MAI-2010-23

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

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Limestone)

Fatal Falling Material Accident
December 23, 2010

Austin Powder Company
Contractor I.D. No. E24

at

Mid-Coast Aggregates LLC- Mazak Mine
Mid-Coast Aggregates LLC
Webster, Sumter County, Florida
Mine I.D. No. 08-01282

Investigators

Harry M. Wade
Mine Safety and Health Inspector

Felix W. DeLoach
Supervisory Mine Safety and Health Inspector

Louis A. Owens
Mine Safety and Health Inspector

Alan R. Coburn
Supervisory Mine Safety and Health Specialist

Steven J. Vamossy, P.E.
Civil Engineer

Originating Office
Mine Safety and Health Administration
Southeastern District
135 Gemini Circle, Suite 212 Birmingham, Alabama 35209
Michael A. Davis, District Manager

OVERVIEW

Kenneth J. Stephens Jr**.,** contract blaster, age 35 was killed on December 23, 2010, while conducting a post-blast examination. After firing a blast, he walked immediately to the blast site to examine the shot material. He was standing to the east of the shot material when the ground collapsed, engulfing him in the water filled pit.

The accident occurred because mine and blasting contractor management policies, procedures, and controls were inadequate. A large cavity had been detected in the drill pattern on December 17, 2010. However, neither mine nor contract management established any policies, procedures, or controls to ensure that persons could safely perform work at the blast site. The full extent of the cavity was not known before the blast was initiated.

Methods such as advance drilling and geophysical surveys, electrical resistivity, ground penetrating radar or other available methods were not used to identify subsurface cavities and voids. Effective workplace examinations to identify and correct all hazards were not conducted. No procedures were in place requiring a waiting period before persons conducted post-blast examinations.

In December 2008, a similar cavity was encountered in this pit. At that time, extensive drilling was conducted to determine the full extent of the cavity.

GENERAL INFORMATION

Mid-Coast Aggregates LLC- Mazak Mine (Mazak), a surface crushed limestone operation, owned and operated by Mid-Coast Aggregates LLC, is located in Webster, Sumter County, Florida. The principal operating official is William Barnes, plant manager. The mine operates one eight hour shift per day, five days per week. Total employment is 16 persons.

A wet process extraction is used to mine the limestone. Before mining the material, approximately 15 to 20 feet of soil overburden is removed using excavators and haul trucks. A limestone bench is then exposed which serves as the pit floor. The bench is about 8 to 10 feet above the water level. The material is drilled, blasted, and then removed from the water by a dragline. The excavated material is dumped behind the dragline in a windrow and allowed to dry. The material is then crushed and screened. The finished product is sold as road base material.

Austin Powder Company, located in Anthony, Marion County, Florida, is contracted by Mazak to perform blasting operations at the mine. The principal operating official is Charles Phillips, location manager.

North Florida Drilling Services, Inc., located in Ocala, Marion County, Florida, is contracted by Mazak to perform drilling operations at the mine. The principal operating official is Brent Hackworth, president.

The last regular inspection at this operation was completed on December 14, 2010.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Kenneth J. Stephens Jr., (victim) reported to the mine about 6:30 a.m., his normal starting time. Kenneth J. Stephens Sr., (victim's father), explosives truck driver/helper, arrived at the same time. They started placing explosive boosters and other material to load the blast holes. David Veres, sales representative/blaster for Austin Powder Company arrived about 7:00 a.m. Samuel Evans, laborer for Mazak, also arrived. Veres and Evans measured the holes to verify their depths, while Kenneth Stephens Jr. loaded the blast holes. Evans left and Veres helped to load the blast holes. After the shot was loaded and ready to detonate, the pit was evacuated and the warning signals were given before detonating the blast.

Veres, William Barnes, plant manager, Andrew Bedgood, pit supervisor, Kenneth Stephens Sr., James Henderson, dragline operator, Ronald Moore, dragline oiler, and Charles Stokes, front- end loader operator, were located on the north ramp to view the blast from a safe distance.

The blast was detonated at 11:58 a.m. by Kenneth Stephens Jr. who was located behind a dragline on the south end of the blast area. Within minutes, he walked toward the blast site to conduct the post-blast examination. Veres, Barnes, and Bedgood noticed that part of the blast material that typically stands fragmented above the water had disappeared into the water. Kenneth Stephens Jr. telephoned the all clear signal to the group to walk to the blast site.

Veres and Barnes re-entered the pit area, followed by Bedgood. They estimated that the victim was standing within 20 feet from the edge of the shot material. Veres approached to talk to Kenneth Stephens Jr. when the ground collapsed engulfing Kenneth Stephens Jr. in the water-filled pit. The ground continued to collapse in the area and the victim was not seen again. Bedgood threw a rescue bag with 100 feet of line into the water but it went into the falling material.

At 12:03 p.m., Veres called emergency medical services (EMS). Rescue units from the Sumter County Sheriff's Department arrived at 12:20 p.m. A dive team was called at 12:25 p.m. They arrived at 1:25 p.m., surveyed the area, and determined that it was not safe to enter the water because pieces of material were falling where the victim went into the water. An air unit was activated at 12:31 p.m. The helicopter flew over the area to take photographs. Lake County and Sumter County EMS units and the Sumter County fire rescue units also arrived to assist. However, the rescue attempts were unsuccessful and the search was called due to darkness.

Recovery Efforts

On December 24, 2010, the Sheriff's Department attempted to utilize a dive team; however, material continued to collapse into the water creating an unsafe condition for the divers and the attempted recovery efforts were halted for several days. On December 27, 2010, mine management started to mobilize recovery resources. On December 28, 2010, mine management held a meeting with the various recovery resources and EMS recovery teams. A recovery plan was formulated and submitted to the Mine Safety and Health Administration (MSHA) and MSHA reviewed the plan and modified the 103(k) order.

In an attempt to recover the victim, several different types of equipment were used including an excavator, two different types of cranes with clam shells, a drag line and a rotary drill. Mazak hired numerous consultants and used the expertise of field recovery experts from industry.

Approximately 44,000 cubic yards of material were removed from the pit where the victim was engulfed in the collapsed material. Mine management, the Sumter County Sheriff's Department, and MSHA personnel observed all the material as it was removed from the area.

During the recovery, cadaver dogs, ground penetrating radar, helicopters with heat sensors, boats with sonar, divers with cameras, and exploratory drilling, were utilized

during the recovery process. MSHA personnel were on site continually monitoring the recovery efforts. MSHA inspectors assisted with the ground and boat patrols that examined the recovery area. The recovery efforts continued until noon on April 11, 2011, when mine management called off the search. MSHA was notified officially of this decision at 2 p.m. that day.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 12:09 p.m., on December 23, 2010, by telephone call from William Barnes, mine manager, to the National Call Center. Samuel Pierce, acting assistant district manager, was notified and an investigation was started the same day. An order was issued under the provisions of Section 103(j) of the Mine Act to ensure the safety of the miners. This order was later modified to a 103 (k) of the Mine Act when the first Authorized Representative arrived at the mine.

MSHA's accident investigation team traveled to the mine, conducted a physical inspection of the accident scene, interviewed employees, and reviewed documents and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine, drilling, and blasting contractor management and employees and the Sumter County Sheriff's Department.

DISCUSSION

Location of the Accident

The accident occurred at a pit that was rectangular in shape, oriented in a general north-south direction, and located within the mining area referred to as Phase II. The pit has a surface area of approximately 9 acres that extends below the groundwater table and remains flooded. The maximum depth of the water in the pit is 90 feet. Prior to the accident, the water in the pit was pumped using a single diesel-powered pump, located in the northwest corner of the pit. The discharge was reportedly 4,000 gallons per minute.

The active mining face is along the east side of the pit. The area where the ground collapsed following the blast was approximately 200 feet from the north end of the pit.

Equipment

At the time of the accident, a dragline and a drill rig were in the pit. The dragline was a Bucyrus Erie Model 770 equipped with a 20-yard-capacity bucket. The drill rig, owned by North Florida Drilling Services Inc., was an Ingersoll Rand DM-MSP XL-1400 rotary drill equipped with a 7 3/4-inch diameter bit. The equipment was not considered to be a contributing factor in the accident.

Geology

The limestone formation within the pit was determined to be part of the Ocala Limestone group as classified by the United States Geological Survey (USGS). The limestone in this area, and throughout Florida, is generally known as a karst-forming rock. Karst rock terrain is characterized with sinkholes, cavities, and underground aquifers that are formed when soluble rock (such as limestone) is dissolved or naturally eroded by water. Management did not conduct a geological survey or a geotechnical evaluation to determine if these anomalies or any other specific geologic features (faults, joints, etc.) were present.

Prior Cavity Encountered

In December 2008, Florex Explosives Inc., the previous drilling and blasting contractor at this mine, discovered a cavity while drilling the second round for the key cut of this pit. Mine management was notified and extensive drilling was conducted to determine the full extent of the cavity.

The cavity was discovered in seven holes of the drill pattern. Holes were measured with a 300-foot weighted tape. The tape did not reach the bottom in two of the holes. The other holes measured from 120-180 feet deep. On December 22, 2008, the blast was detonated. The blaster moved persons further back than usual from the blast area. The material collapsed into the cavity about 35 seconds after the blast. The material continued to collapse rather violently for an hour. The collapse was witnessed from the haul road 700 feet away. The collapsed area eventually encompassed the entire blast area and an additional 30-60 feet beyond the blast area.

Drilling and Blast Hole Layout

According to the North Florida Drilling Services, Inc. drill log, dated December 22, 2010, 40 holes (four rows with ten holes each) were drilled as per the planned blasting pattern. The holes were numbered 1 through 40 and drilled in a staggered pattern with 21- foot spacings between holes. Each row of holes was aligned approximately parallel to the free face/water, also referred to as the burden distance. The first row of holes was drilled 18 feet from the burden distance and the last (fourth) row of holes was approximately 81 feet back.

Each hole was drilled to a depth of 100 feet. This information was included on the drill log, the driller recorded the general stratigraphy of each hole including rock/soil type and thickness of each layer. The rock/soil types were simply classified as soft, medium, hard, flint/extremely hard, or sand, clay as per the legend on the drill log sheet. The classifications were based on the driller's experience with the pressure feedback from the drill rig. Cavities/voids were also recorded on the drill log when they were encountered.

Drill Pattern and Conditions Encountered

On December 17, 2010, Benjamin Coffee, driller, and James Deardorff, driller helper, encountered a cavity while drilling blast holes. Coffee pulled the drill off that hole and drilled three additional holes where he again encountered the cavity. The drill crew measured the four holes drilled with a weighted tape measure. They measured 75-80 feet

of material and then detected a void/cavity below the material. Coffee shut down the drill and told James Henderson, dragline operator, to contact Bedgood. When Bedgood arrived, Coffee informed him of the cavity. Bedgood stated that he would talk to Barnes regarding the cavity. The drillers then left since their shift ended.

On December 20, 2010, Bedgood told Coffee to continue to drill the same pattern. The drillers encountered seven more holes that penetrated the cavity, making a total of 11 holes. Specifically, the cavity was discovered in hole numbers 27, 31, and 35 in row 1, hole numbers 28, 32, and 36 in row 2, hole numbers 25, 29, and 33 in row 3, and hole numbers 26 and 30 in row 4. The cavity was located within the north end of the drill pattern. Based on the holes drilled, the cavity was estimated to have minimum horizontal dimensions of 63 feet in width (east-west direction) and 42 feet in length (north-south direction). The drillers did find solid ground to the north and south of the cavity but did not drill to the east to determine how far the cavity extended in that direction.

Additional holes were drilled to a depth of 70 feet but none of these holes penetrated the cavity. Shot tubes were placed in the 11 holes that had penetrated the cavity. The tubes were spray painted orange so the blaster could easily determine which holes had penetrated the cavity.

On December 22, 2010, Kenneth Stephens Jr. and Veres, went to the drill. Veres talked to Coffee, who told him about the cavity and its depth. Coffee also told Veres that the extent of the cavity to the east had not been determined. Veres told Coffee to leave a copy of the drill log on the dashboard of the drill for the blaster. After drilling was completed, the drill crew went to the mine office and met with Barnes and Bedgood. Coffee gave them a copy of the drill log and discussed the cavity. He also told them that the extent of the cavity to the east had not been determined. The drill crew then left the mine.

Post-Blast Ground Collapse

Investigators determined that the blast immediately brought down a majority of the limestone bench directly above the cavity and as a result, it was completely submerged below the water level. This corresponded to a rectangular-shaped, approximately 80-foot wide by 140-foot long, section of the bench within the north end of the blast area. A 250-foot long section of the muck pile was observed still partially standing above the water. This section of the muck pile contained the remaining south end section of the blast area in addition to material from a blast approximately one month earlier.

There was evidence of backbreak (cracks) running parallel to the face due south immediately adjacent to the collapsed area. These cracks were approximately 20 to 40 feet from the edge of the standing portion of the muck pile.

The section of ground that collapsed east of the blast area (engulfing the victim) had formed a general U-shape and was referred to as the “horseshoe”. The collapsed section formed a vertical scarp approximately 120 feet wide (north-south direction) that extended up to 20 feet to the east beyond the last row of holes drilled. Investigators could not determine how deep the scarp extended below the water level.

Weather
The weather at the time of the accident was mainly clear with a temperature of 60 degrees Fahrenheit. No significant precipitation fell during the week prior to the accident. Weather conditions were not considered to be a contributing factor in the accident.

Training and Experience
Kenneth J. Stephens Jr.(victim), had 2 years and 2 weeks of experience at this mine and 12 years of experience as a blaster with Austin Powder Company. He had received training in accordance with 30 CFR Part 46.

Kenneth J. Stephens Sr. had 8 years of experience as an explosives truck driver/helper with Austin Power Company. He had received training in accordance with 30 CFR Part 46.

David Veres had 27 years as a blaster and had worked for Austin Powder Company for 15 years. He had received training in accordance with 30 CFR Part 46.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following root causes were identified.

Root Cause: Mine management did not have any policies, procedures, or controls in place to protect persons at the blast site.

Corrective Action: Mine management established Standard Operating Procedures (SOP) for detecting cavities that includes drilling to determine the full extent of any cavities detected.

Root Cause: Blasting contractor management did not conduct a risk assessment to determine the potential hazards or to establish safe work procedures at the blast site.

Corrective Action: Blasting contractor management established Standard Operating Procedures for conducting blasting at the mine. These safe operating procedures address activities regarding loading the blast, conducting the blast, and conducting post- blast examinations.

CONCLUSION

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The accident occurred because both mine and contractor management policies, procedures, and controls were inadequate. A large cavity had been detected in the drill pattern on December 17, 2010. However, mine or contract management did not establish any policies, procedures, or controls to ensure that persons could safely perform work at

the blast site. The full extent of the cavity was not known before the blast was initiated.

Methods such as advance drilling and geophysical surveys, electrical resistivity, ground penetrating radar or other available methods were not used to identify subsurface cavities and voids. Effective workplace examinations to identify and correct all hazards were not conducted. No procedures were in place requiring a waiting period before persons conducted post- blast examinations.

In December 2008, a similar cavity was encountered in this pit. At that time, extensive drilling was conducted to determine the full extent of the cavity.

ENFORCEMENT ACTIONS

Issued to Mid-Coast Aggregates LLC

Order No. 6097441 was issued on December 23, 2010, under the provisions of Section 103(j) of the Mine Act:

A fatal accident occurred at this operation on December 23, 2010. This order is being issued under section 103(j) of the Mine Act to assure the safety of all persons at this operation. This order is also issued to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident. It prohibits all activity at the dragline pit area except to the extent necessary to rescue an individual or prevent or eliminate an imminent danger until MSHA has determined that it is safe to resume normal mining operations in this area.

Citation No. 6507048 was issued on May 18, 2011, under the provisions of 30 CFR 56.3130:

A fatal accident occurred at this mine on December 23, 2010, when the ground collapsed under a contact blaster as he entered the blast site to examine a shot. The mining method used failed to maintain bank stability where persons worked or traveled in performing their assigned tasks.

Management engaged in aggravated conduct constituting more than ordinary negligence in that they were aware that an underground cavity extended out of the blast site and under the bank and took no action to address the hazard. This is an unwarrantable failure to comply with a mandatory standard.

The citation was terminated on May 18, 2011. The mine operator incorporated new procedures in the mining method to include the use of one of the following; ground penetrating radar (GPR), electrical resistivity (ER) and capacity-coupled resistivity (CCR) for early void detection in the mining areas. The mine operator has included

Standard Operating Procedure (SOP) in the drilling and blasting procedures for maintaining bank and slope stability.

Order No.6507049 was issued on May 18, 2011, under the provisions of 30 CFR 56.18002(a).

A fatal accident occurred at this mine on December 23, 2010, when the ground collapsed under a contact blaster as he entered the blast site to examine a shot. Management failed to initiate appropriate action to correct a known hazardous condition.

On December 17, 2010, a cavity was discovered in the drill pattern beginning at a drill depth of 75 feet and extending down to a depth of 180 feet. The mine operator had been on notice that the hazard existed seven days prior to the accident. Management engaged in aggravated conduct constituting more than ordinary negligence by failing to determine the extent that the cavity extended to the east and back under the work area and failed to promptly initiate appropriate action. This is an unwarrantable failure to comply with a mandatory standard.

The citation was terminated on May 18, 2011. The mine operator implemented a Standard Operating Procedure (SOP) for conducting work place examinations that requires drillers and blasters to also conduct examinations of geophysical surveys and drill logs to identify significant voids in the mining areas and take appropriate action to correct any hazards found. Contract drillers and blasters have been notified to implement these new procedures.

Issued to Austin Powder Company

Citation No.8633102 was issued on May 18, 2011, under the provisions of 30 CFR 56.18002(a).

A fatal accident occurred at this mine on December 23, 2010 when the ground collapsed under the contact blaster as he entered the blast site to examine the shot. The contract blasting company failed to initiate prompt action to correct a hazardous condition. On December 17, 2010, a cavity was discovered in the drill pattern beginning at a drill depth of 75 feet and extending down to a depth of 180 feet. On December 22, 2010, the contract blasting company was made aware that a cavity existed below the work area and that the extent of the cavity had not been determine to the east and back under the work area and failed to promptly initiate appropriate action. This is an unwarrantable failure to comply with a mandatory standard.

The citation was terminated on May 18, 2011. The contractor incorporated a Standard Operating Procedure (SOP) into their workplace examination that requires blasters to review drill logs to determine appropriate action to follow where significant voids have been identified.

Approved:_____ Date:_____

Michael A. Davis
District Manager

APPENDICES

A. Persons Participating in the Investigation

B. Overview of Pit Area after Accident

C. Victim Data Sheet

APPENDIX A

Persons Participating in the Investigation

Mid-Coast Aggregates LLC

William J. Barnes	Mine Manager
Andrew R.Bedgood	Field Supervisor
R. Marcus Jobes	Area Manager
Vaughn P. Stough	Vice- President McDonald Investment Co. Inc.

Austin Powder Company

R. Reed Sapp	Vice -President Sales
David R. Veres	Sales Representative

North Florida Drilling Services, Inc.

Brent Hackworth	President
Benjamin Coffee	Driller
James Deardorff	Driller/Helper

Behre Dolbear Minerals Industry Advisors

H. John Head, P.E.	President

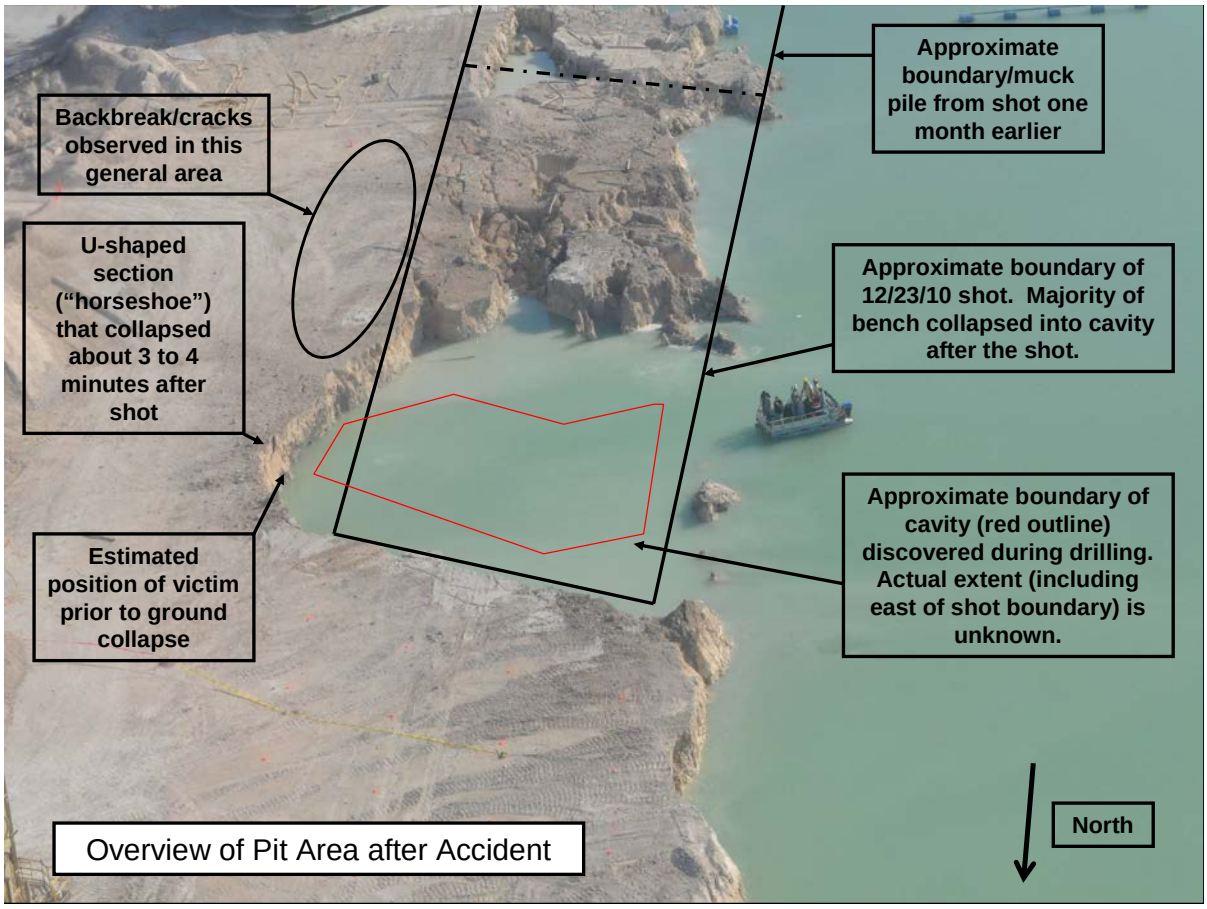
Sumter County Sheriff's Department

Gary Brannen	Captain Criminal Investigations Div.
Michael Bishop	Detective Criminal Investigations Div.

Mine Safety and Health Administration

Harry M. Wade	Mine Safety and Health Inspector
Felix W. DeLoach	Supervisory Mine Safety and Health Inspector
Louis A. Owens	Mine Safety and Health Inspector
Steven J. Vamossy, P.E.	Civil Engineer
Alan R. Coburn	Supervisory Mine Safety and Health Specialist

APPENDIX B


Backbreak/cracks observed in this general area
U-shaped section ("horseshoe") that collapsed about 3 to 4 minutes after shot
Estimated position of victim prior to ground collapse
Approximate boundary/muck pile from shot one month earlier
Approximate boundary of 12/23/10 shot. Majority of bench collapsed into cavity after the shot.
Approximate boundary of cavity (red outline) discovered during drilling. Actual extent (including east of shot boundary) is unknown.
North
Overview of Pit Area after Accident

APPENDIX C

Accident Investigation Data - Victim Information

Event Number: 0 9 1 3 4 0 9

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

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Degree of Injury:
Kenneth J. Stephens Jr.	*M*	*35*	*01 Fatal*

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:	6. Date and Time Started:
a. Date: 12/23/2010 b.Time: 12:00	*a. Date: 12/23/2010 b.Time: 7:00*

7. Regular Job Title:	8. Work Activity when Injured:	9. Was this work activity part of regular job?
107 senior blaster	*003 post blast survey*	Yes | X | No |

10. Experience	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	*12*	*0*	*0*	b. Regular Job Title:	*12*	*0*	*0*	c: This Mine:	*2*	*2*	*0*	d. Total Mining:	*12*	*0*	*0*

11. What Directly Inflicted Injury or Illness?	12. Nature of Injury or Illness:
126 drowned	*110 drowned*

13. Training Deficiencies:
Hazard: | | New/Newly-Employed Experienced Miner: | | Annual: | | Task: | |

14. Company of Employment: (If different from production operator)
Austin Powder Company
Independent Contractor ID: (if applicable) *E24*

15. On-site Emergency Medical Treatment:
Not Applicable: | X | First-Aid: | | CPR: | | EMT: | | Medical Professional: | | None: | |

16. Part 50 Document Control Number: (form 7000-1)
17. Union Affiliation of Victim: