Virginia Department of Mines, Minerals & Energy
Division of Mines

Accident Investigation Report
Underground Coal Mine

Fall of Roof/Rib Material
Fatality Investigation Report
April 22, 2008

Osaka Mining Corporation
Mine No. 1
Mine Index No. 14810AA
Wise County, Virginia

CONTENTS

FALL OF ROOF/RIB MATERIAL
FATALITY INVESTIGATION REPORT
OSAKA MINING CORPORATION
MINE NO.1

On April 22, 2008, at approximately 8:55 a.m., an underground fall of roof/rib material accident occurred at Osaka Mining Corporation, Mine No. 1, Mine Index No. 14810AA. David Sizemore, roof bolting machine operator, was seriously injured in the fall of roof/rib material accident while observing a remote control continuous mining machine operating in the face area of the No. 7 entry on the 001 Section. Mr. Sizemore was transported by Virginia Med-Flight to the Wellmont Holston Valley Medical Center located in Kingsport, Tennessee, where he died from his injuries as a result of the accident. Mr. Sizemore, age 61, had approximately 30 years total mining experience with two years and three months employment at Osaka Mining Corporation, Mine No. 1. The Department of Mines, Minerals and Energy's Division of Mines (DM) was notified of the accident at approximately 9:47 a.m. on April 22, 2008, and a joint investigation with the Federal Mine Safety and Health Administration (MSHA) was initiated the same day. The last regular inspection of this mine was completed on February 11, 2008.

COMMENTARY

Osaka Mining Corporation, Mine No. 1 is located approximately four (4) miles from Appalachia, Virginia off State Route 685 on Mud Lick Road. Cumberland Resources Corporation is the parent corporation of Osaka Mining Corporation. This underground mine is a one section drift mine developed in the Imboden Coal Seam. Only main line development has been conducted by mining personnel since this operation began in November 2005. At the time of the accident, mine seals had been recently constructed across the old abandoned Westmoreland Prescott Mine No. 2-West Panel. Development of the Mud Lick Mains had been completed and the active section was developing the seven (7) entries off the 1 North Mains. The mining height ranges from 60 to 96 inches. Approximately 1,500 tons of coal are produced on the day and third shifts with maintenance and cleanup work performed on the evening shift. This operation employs three (3) surface and thirty-eight (38) underground mining personnel utilizing remote control continuous mining machines, dual-boom roof bolting machines, and shuttle cars to produce coal.

On Tuesday, April 22, 2008, the day shift crew departed the surface to travel underground at approximately 6:30 a.m., under the supervision of John Mullins, section mine foreman. Mr. Mullins and the dayshift crew traveled on a diesel-powered mantrip to the 001 Section. The 001 Section is located on the 1 North Mains, approximately 13,100 feet from the surface. The dayshift crew, consisting of 10 personnel, arrived on the working section at approximately 7:00 a.m. Upon their arrival on the working section, the crew dispersed to their assigned jobs as directed by Mr. Mullins, section mine foreman. One (1) Joy continuous mining machine and one (1) Fletcher dual-boom roof bolting machine are located on the left and right sides, respectively, on the working

section. Ronald Turner, third shift section mine foreman, had conducted a preshift examination of the 001 Section. The preshift examination results were reported by Mr. Turner to surface personnel and he verified that he had not observed any hazardous conditions during the preshift examination. Mr. Turner stated that while conducting the preshift examination, he did not observe any unusual roof conditions where the accident occurred later in the No. 7 entry.

Upon arrival of the crew on the working section, Mr. Mullins, the section mine foreman, traveled to the No. 1 entry and proceeded to make an onshift examination of the working section. He concluded his onshift examination in the No. 7 entry. Mr. Mullins stated that he did not observe any unusual roof conditions across the working section as he was conducting the onshift examination. Christopher Huff, the regular right side roof bolting machine operator, and Mr. Sizemore, who was filling in as a bolting machine operator for this shift, traveled to the right side bolting machine and finished bolting the No. 5 entry right crosscut. Jerry Dorton, the regular roof bolting machine operator on the right side machine, was off work on this day. Mr. Sizemore, normally assigned as the day shift outby LO-Trac operator, was filling in for Mr. Dorton. Mr. Sizemore had eleven years (11) and two (2) months experience as a roof bolting machine operator for Cumberland Resources Corporation at different mining operations.

Prior to his employment with Cumberland Resources Corporation, Mr. Sizemore had approximately 19 years underground mining experience with Westmoreland Coal Company, most of which included operating roof bolting machines.

Mr. Huff and Mr. Sizemore began their work shift by installing permanent roof supports in the No. 5 entry-right crosscut. Mr. Huff and Mr. Sizemore installed two (2) rows of six-foot point anchor roof bolts, twelve-foot supplemental cable bolts, and eight-foot super bolts in the No. 5 entry-right crosscut. Mr. Huff and Mr. Sizemore then moved the roof bolting machine to the last open crosscut between the No. 6 and No. 7 entries.

The right side Joy 14 CM-15 continuous mining machine was positioned in the No. 7 entry, immediately outby the last open crosscut and had been prepared for mining in the No. 7 entry face area. Charles Fields, Jr., section repairman, had been preparing the machine for mining in the No. 7 entry by installing ripper head-cutter bits and checking the ripper head-water spray system. While he was servicing the mining machine in the general vicinity where the accident occurred in No. 7 entry, Mr. Fields stated that he did not observe any unusual roof conditions and did not observe anything out of the ordinary while at this location.

The third-shift production crew had completed mining the No. 2 entry face area. Marvin Music, day shift continuous mining machine operator, traveled to the left side Joy 14 CM-15 mining machine. Mr. Music moved the mining machine from the No. 2 entry to the No. 1 entry and cut the face area. After completing the cut in the No. 1 entry face area, Mr. Music then traveled to the No. 7 entry where the right side continuous mining machine was located just outby the last open crosscut. Mr. Music moved the right side continuous mining machine into the face area of the No. 7 entry

and began producing coal. At this time, Mr. Huff and Mr. Sizemore were located in the last open crosscut between No. 6 and No. 7 entries, near the right side bolting machine. After Mr. Music had loaded several cars of coal from the No. 7 entry face area, Mr. Huff and Mr. Sizemore departed their location in the last open crosscut at their assigned roof bolting machine and walked over to the No. 7 entry where Mr. Music was operating the remote control continuous mining machine. Mr. Huff remained in the No. 7 entry near Mr. Music and Mr. Sizemore for approximately five (5) minutes and then traveled back to the right side roof bolting machine located in the last open crosscut between No. 6 and No. 7 entries. Mr. Sizemore remained in No. 7 entry where Mr. Music was operating the continuous mining machine. At this time, Eric Stallard, utilityman, was located in the last open crosscut between No. 6 and No. 7 entries loading roof support materials onto the right side roof bolting machine. Mr. Music had completed the cut in the No. 7 entry face area and had trammed the machine back to round off the inby rib corner at the junction of the No. 6 right crosscut and the No. 7 entry. While Mr. Music was rounding off the left side-inby rib corner, some roof material fell in the No. 7 entry face area. Mr. Music discontinued rounding off the rib corner and trammed the continuous mining machine back into the No. 7 entry face area to clean up the fallen rock. Mr. Music was preparing to load the fallen rock from the No. 7 entry face area into a shuttle car operated by Roger McCoy. Mr. Sizemore was standing near Mr. Music when a section of roof/rib rock fell from the right side of the entry striking both Mr. Music and Mr. Sizemore. Mr. McCoy, shuttle car operator, did not actually see the roof/rib rock fall but did hear a noise and did observe Mr. Music and Mr. Sizemore lying on the mine floor in the vicinity of the fallen rock.

The roof/rib rock pushed Mr. Music down toward the side of the shuttle car. Mr. Music sustained minor injuries to his right shoulder. The roof/rib rock knocked Mr. Sizemore off his feet, while entrapping his legs against the mine floor. The section of rock that struck Mr. Sizemore measured seventy-two (72) inches in length, nineteen (19) to thirty-six (36) inches in width and zero (0) to fourteen (14) inches in thickness. Mr. Sizemore received serious injuries when the rock material struck him.

Mr. McCoy began calling for help after observing Mr. Music and Mr. Sizemore lying on the mine floor. Mr. Huff, who was located in the last open crosscut between the No. 6 and No. 7 entries, heard someone calling for help from the No. 7 entry and he immediately also began calling for help. Mr. Stallard, who also was located in the last open crosscut between No. 6 and No. 7 entries at the right side roof bolting machine, heard Mr. Huff calling for help and immediately traveled to the accident location in No. 7 entry.

Mr. Stallard, Mr. Music, and Mr. McCoy began immediately to remove the fallen rock from on top of Mr. Sizemore. Other section crew members were alerted to the accident and began arriving to assist in extricating, stabilizing, treating, and preparing Mr. Sizemore for transport to the surface. Mr. Huff immediately traveled across the working section to summons Mr. Mullins, section mine foreman, to the accident scene. Mr. Mullins traveled immediately to the accident scene to evaluate the situation. Dennis Gibson, an other shuttle car operator who was located at the feeder – belt conveyor where the mine telephone is located, saw someone running across the section. Mr.

Gibson traveled to the accident location and after observing the situation, returned to the mine telephone location at the feeder. Mr. Gibson called to the surface and reported the accident to Hagy Barnett, mine superintendent. Mr. Gibson instructed Mr. Barnett to request rescue squad medical assistance.

After evaluating the accident scene, Mr. Mullins immediately traveled to the mine telephone where Mr. Gibson was located. Mr. Mullins instructed Mr. Gibson to call Mr. Barnett and to summons Virginia Med-Flight for medical assistance.

At 8:59 a.m., Mr. Barnett called the emergency number – 911 and requested an ambulance and Med-Flight.

When other crew members arrived at the accident location, the fallen rock was moved slightly away from Mr. Sizemore to enhance extrication and stabilization efforts while the crew continued to provide first aid treatment. Mr. Music and James Ramey, battery scoop operator, were the assigned medical personnel on this shift. Both men have been certified in Advanced First Aid as required by the Coal Mine Safety Laws of Virginia. Mr. Music and Mr. Ramey directed the first aid treatment and stabilization efforts of Mr. Sizemore. Mr. Sizemore was experiencing breathing difficulties but remained conscious and responsive while being stabilized on a spineboard at the scene of the accident. Mr. Music, Mr. Ramey, and remaining section crew personnel secured Mr. Sizemore on a spineboard on his left side and treated his head injuries with dressings and bandages. Mr. Music and Mr. Ramey verified that Mr. Sizemore was conscious and talking coherently but was experiencing severe pain and difficulty in breathing.

Mr. Sizemore was loaded onto the section diesel-powered mantrip, which departed the working section at approximately 9:28 a.m. enroute to the surface. Mr. Music, Mr. Ramey, and three (3) other crew members boarded the mantrip and assisted with stabilizing and transporting Mr. Sizemore to the surface.

Section personnel arrived on the surface with Mr. Sizemore at approximately 9:54 a.m. Members of the Appalachia Rescue Squad and Med-Flight medical staff were present when mine personnel arrived on the surface with Mr. Sizemore. Mr. Sizemore was conscious, responsive, and talking coherently upon his arrival on the surface at approximately 9:54 a.m. Medical personnel affiliated with Med-Flight and the Appalachia Rescue Squad examined and prepared Mr. Sizemore for transportation. The Appalachia Rescue Squad and Med-Flight medical personnel departed the mine at 10:22 a.m. and transported Mr. Sizemore by ambulance to the Wellmont Lonesome Pine Hospital helicopter pad. Upon arrival at the Wellmont Lonesome Pine Hospital at 10:33 a.m., Mr. Sizemore was transferred from the ambulance to the Med-Flight helicopter and transported directly to Wellmont Holston Valley Medical Center located in Kingsport, Tennessee.

At approximately 10:54 a.m., the Med-Flight helicopter, with Mr. Sizemore, arrived at the Wellmont Holston Valley Medical Center. At 11:15 a.m., Mr. Sizemore was pronounced dead from his injuries.

STATEMENTS FROM MINE PERSONNEL AND OTHER FACTORS

Statements from mine personnel interviews and other factors determined during the investigation revealed the following:

1. There were two (2) eye witnesses to the accident. Marvin Music, continuous mining machine operator, and Roger McCoy, shuttle car operator, were operating their respective equipment in the immediate accident area.

2. Mr. Music and Mr. Ramey, battery scoop operator, were the assigned medical personnel on this shift and certified in Advanced First Aid as required by the Coal Mine Safety Laws of Virginia. Mr. Music and Mr. Ramey were responsible for directing the first aid treatment and stabilization of Mr. Sizemore.

3. The following includes statements of mining personnel and events that occurred on April 21 - 22, 2008, that were factors before and during the accident:

    - Jerry Long and Derrick Collins, right side roof bolting machine operators, stated that they installed permanent and supplemental roof supports in the No. 7 entry at the accident location. These permanent and supplemental roof supports were installed on the third-shift on April 21 – 22, 2008. Mr. Long and Mr. Collins also stated that they did not observe any unusual roof conditions as they were installing permanent and supplemental roof supports in the accident area.

    - Ronald Turner, third shift section mine foreman, stated that he conducted a preshift examination of the 001 Section on April 22, 2008. Mr. Turner stated that he conducted a thorough, visual roof examination of the No. 7 entry where the accident occurred. Furthermore, he stated that during this examination, he did not observe any hazardous or unusual roof conditions.

    - John Mullins, day shift section mine foreman, stated that he conducted an onshift examination of the working section immediately after his arrival on the section. Mr. Mullins stated that while conducting the onshift examination of the working section, he did not observe any hazardous or unusual roof conditions, including where the accident occurred in No. 7 entry. Mr. Mullins stated that while conducting an onshift examination, he routinely observes, evaluates, and identifies areas where additional roof supports may need to be installed. Mr. Mullins also stated that he was located in the No. 4 entry at the time of the accident.

    - Marvin Music, continuous mining machine operator, stated he moved the right side continuous mining machine into position and began producing coal from the face area of No. 7 entry. Mr. Music stated that Mr. Sizemore and Mr. Huff came to his location in No. 7 entry as he was loading shuttle cars. Mr. Music stated that Mr. Sizemore stayed with him during the entire

time that he was cutting the No. 7 entry face area. Mr. Music stated that he had completed cutting the face area and had trammed the machine back to round off the No. 6 to No. 7 crosscut, inby rib corner. As Mr. Music was rounding off the corner, some rock fell in the face area of the No. 7 entry. Mr. Music stated that he trammed the machine back into the No. 7 entry face area and was making preparations to load the fallen rock from the face area. Mr. Music stated, at this time, the roof/rib rock fell, striking both him and Mr. Sizemore. Mr. Music stated that after retrieving his hard hat and cap light, he observed Mr. Sizemore with his legs entrapped by the roof/rib rock. Mr. Music stated that he assisted Mr. McCoy and Mr. Eric Stallard in removing the roof/rib rock from on top of Mr. Sizemore. Mr. Music, certified in Advanced First Aid, initiated first aid treatment on Mr. Sizemore.

- Roger McCoy, shuttle car operator, stated that Mr. Music had trammed the continuous mining machine back into the face area of No. 7 entry and was making preparations to load the fallen rock from the face area when the accident occurred. Mr. McCoy stated that he did not actually see the roof/rib rock fall but he did hear a noise and observed Mr. Music and Mr. Sizemore lying on the mine floor in the immediate area of the fallen roof/rib rock. Mr. McCoy stated that he assisted Mr. Music and Mr. Stallard in removing the roof/rib rock from on top of Mr. Sizemore's legs and assisted Mr. Music in providing first aid treatment to Mr. Sizemore.

- James Ramey, battery scoop operator, stated that he performed ventilation work in the No. 7 entry where the accident occurred at the beginning of his shift on April 22, 2008. Mr. Ramey prepared the ventilation curtain for the No. 7 entry face area to be cut with the continuous mining machine. Mr. Ramey stated that he performed this ventilation work along the roof/rib rock that fell resulting in the accident and did not observe any unusual roof conditions while at this location. Mr. Ramey, certified in Advanced First Aid, assisted the crew in administering first aid treatment to Mr. Sizemore.

- Christopher Huff, right side roof bolting machine operator, stated that he and Mr. Sizemore had parked their assigned machine in the last open crosscut between No. 6 and No. 7 entries as the continuous miner crew was cutting the No. 7 entry face area. Mr. Huff stated that he and Mr. Sizemore walked over to Mr. Music's location as he was cutting the face area. Mr. Huff departed the location of Mr. Music and Mr. Sizemore after a few minutes and traveled back to the right side roof bolting machine located in the last open crosscut between No. 6 and No. 7 entries. Mr. Huff stated that he heard someone calling for help from the No. 7 entry area and that he began calling for help and immediately traveled across the section to notify Mr. Mullins, section mine foreman. Mr. Huff stated that he traveled on to the accident location in No. 7 entry to assist other crew members in extricating, stabilizing, and treating Mr. Sizemore.

- Eric Stallard, utilityman, stated that he was located in the last open crosscut between No. 6 and No. 7 entries when he heard Mr. Huff call for help. Mr. Stallard stated that he traveled immediately to the No. 7 entry and assisted Mr. Music and Mr. McCoy with removing the fallen roof/rib rock from on top of Mr. Sizemore.

- Dennis Gibson, shuttle car operator, stated that he was located at the feeder – belt conveyor area at the time of the accident. Mr. Gibson stated that he reported the accident to Hagy Barnett, mine superintendent, located on the surface. Mr. Gibson stated that he called Mr. Barnett and requested rescue squad and Med-Flight medical assistance for Mr. Sizemore.

- Charles Fields, Jr., section repairman, stated that he performed maintenance – service work on the continuous mining machine located on the right side of the section at the beginning of this shift. Mr. Fields stated that while performing this maintenance work in No. 7 entry at the general area where the accident occurred, he did not observe any abnormal or unusual roof conditions. Mr. Fields also stated that he observed Mr. Mullins, section mine foreman, conducting an onshift examination in the No. 7 entry as he was performing maintenance- service work on the continuous mining machine at the beginning of the shift.

PHYSICAL FACTORS

The investigation of physical factors revealed the following:

1. The fall of roof/rib material accident occurred on April 22, 2008, at approximately 8:55 a.m. The accident occurred on the 1 North Mains – 001 Section, in the No. 7 entry just inby the last open crosscut -100 feet inby survey station No. 597.

2. The roof and rib material that fell was approximately 17.5 feet outby the last row of permanently installed roof supports. The roof and rib material that fell was approximately 72 inches in length, 36 inches in width on the wide end and tapered to 19 inches on the narrow end and, was zero to fourteen inches in thickness. The roof/rib rock material weighed approximately 790 pounds.

3. The roof/rib rock that fell causing the accident consisted of laminated sandstone with inherent coal streaks. The roof/rib rock that fell consisted of approximately 24 inches of material lying across the mine roof and approximately 18 inches lying on the right rib. The immediate mine roof is composed of inconsistent sandstone and shale.

4. Statements from two certified mine foremen and four (4) other mining personnel that examined and/or traveled in the No. 7 entry at and near the accident location prior to the accident revealed they did not observe or detect any unusual or abnormal roof conditions in the area.

5. Two (2) units of equipment were in operation in the immediate area where the accident occurred: Joy continuous mining machine – serial No. JM6064 and a Joy shuttle car – serial No. ET15895.

6. The average mining height in No. 7 entry was 84 inches. The coal height averaged 60 inches. Approximately 18 to 24 inches of laminated sandstone material above the coal seam had been cut down with the continuous mining machine in the No. 7 entry.

7. The segment of roof rock that fell causing the accident was partially secured on each end with square tin draw rock shields. The square tin draw rock shields are 18 inches by 18 inches.

8. The side of the segment of the roof rock that fell had been supported with a point anchor tension rebar roof bolt, six (6) feet in length. The point anchor tension rebar roof bolt had been installed near the edge of the roof rock but did not appear to have been installed through the rock. An eight (8) inch by eight (8) inch bearing plate with a square tin draw rock shield had been installed with the roof bolt and appeared to be holding approximately eight inches underneath the center edge of the roof rock that fell. The point anchor tension rebar roof bolt, bearing plate, and draw rock shield had been installed approximately 18 inches from the right rib.

9. The point anchor tension rebar roof bolt that was holding the roof rock that fell had broken just above the threads of the bolt.

10. The mine roof in No. 7 entry was fully supported with point anchor tension rebar roof bolts, six (6) feet in length in a six (6) bolt-wide pattern and supplemented with cable rope bolts, twelve (12) feet in length and tensioned super bolts, eight (8) feet in length.

11. The roof/rib rock that struck Mr. Sizemore caused injuries mainly to his head and chest. Mr. Music was also struck by the roof/rib rock, which knocked him to the mine floor causing slight injuries to his right shoulder.

12. The preshift examination record book for the dayshift on April 22, 2008, did not reveal any hazardous roof conditions observed on the 001 Section, including where the accident occurred in the No. 7 entry.

13. John Mullins, section mine foreman, conducted an onshift examination of the 001 Section, including the No. 7 entry where the accident occurred and did not observe any unusual or abnormal roof conditions.

14. Mining personnel, including two (2) employees certified in Advanced First Aid, provided first aid treatment to Mr. Sizemore at the scene of the accident and provided stabilization during transportation to the surface.

15. Mr. Sizemore was responsive, conscious, and talking coherently while at the scene of the accident, during transport to the surface, and prior to being transferred to Med – Flight and Appalachia rescue squad medical personnel.

16. Mr. Sizemore was transported by an Appalachia rescue squad ambulance to the Wellmont Lonesome Pine Hospital helicopter pad. Mr. Sizemore was transported directly from the Wellmont Lonesome Pine Hospital helicopter pad to Wellmont Holston Valley Medical Center located in Kingsport, Tennessee.

17. The roof support materials involved in the accident were sent to the Mine Safety and Health Administration (MSHA) Approval and Certification Center for examination and testing. These roof support materials consisted of the pattern roof bolt which broke, the roof bolt plate, and the square tin draw rock shield. Also, representative samples of other roof support materials to be installed which were located on the roof bolting machine were forwarded to the MSHA testing center located in Pittsburgh, Pennsylvania, for testing. The MSHA Approval and Certification Center also retained the metallurgical testing laboratory of Matco Associates, Inc. of Pittsburgh, Pennsylvania to assist with the examinations and testing of the materials.

18. Based on the physical evidence from the examination and testing results by MSHA's Approval and Certification Center and Matco Laboratories, it was concluded the most likely explanation of the bolt failure mechanism involved a notch defect, due in part to bending of the bolt that may have been introduced during installation of the bolt.

CONCLUSION

On April 22, 2008, at approximately 8:55 a.m., an underground fall of roof/rib material accident occurred at Osaka Mining Corporation, Mine No. 1. David Sizemore, roof bolting machine operator, was seriously injured in a fall of roof/rib material while observing a remote control continuous mining machine operating in the face area of the No. 7 entry on the 001 Section. Mr. Sizemore received serious head and chest injuries when he was struck by a piece of rock that fell from the roof and right rib. Marvin Music, continuous mining machine operator, was also struck by the roof/rib rock and received minor injuries to his right shoulder.

The investigation revealed that a point anchor tension rebar roof bolt, six (6) feet in length, that had secured one side of the roof rock had broken just above the bolt threads. The roof support materials involved in the accident were sent to the Mine Safety and Health Administration (MSHA) Approval and Certification Center for examination and testing as part of the MSHA investigation. These roof support materials consisted of the pattern roof bolt which broke, the roof plate, and the square tin draw rock shield. Also, representative samples of other roof support materials to be installed which were located on the roof bolting machine were forwarded to the MSHA testing center located in Pittsburgh, Pennsylvania, for testing. The MSHA Approval and Certification Center also retained the metallurgical testing laboratory of Matco Associates, Inc. of Pittsburgh, Pennsylvania, to assist with the examinations and testing of the materials.

The conclusions from these examinations and testing revealed the following:

1.) The bolts from the lot tested met the applicable ASTM standard (ASTM F432-95).

2.) A complete review of the American Society for Testing Materials standard should be undertaken to address improvements in the specifications, which will improve the fracture toughness properties of the steel used in the manufacture of mine roof bolts.

3.) Matco Associates, Inc. concluded that a large notch defect was introduced during installation of the broke bolt; that the defect resulted from bending due to uneven roof conditions and further bolt tightening increased the crack size. Matco, Inc. concluded this to be the most likely explanation of the bolt failure mechanism based on the physical evidence.

The investigation revealed that two (2) certified mine foremen and four (4) other mining personnel had either examined or traveled through the accident area prior to the accident and none had observed any unusual or abnormal roof conditions. The investigation revealed that Mr. Sizemore was responsive, conscious, and talking coherently upon his arrival on the surface and before first aid care was transferred to medical personnel affiliated with the Med-Flight and the Appalachia Rescue Squad. Mr.

Sizemore died from his injuries at 11:15 a.m. on April 22, 2008, at Wellmont Holston Valley Medical Center located in Kingsport, Tennessee.

See the attached addendum from this report—(**Summary of August 26, 2008, Meeting with Matco Laboratory**)

ENFORCEMENT ACTION

The following enforcement action was taken as a result of this investigation:

An Order of Closure, No. MRM0004390, was issued under 45.1-161.91A(ii), of the Coal Mine Safety Laws of Virginia, on the 001 Active Section to preserve the scene of the accident pending an investigation. The order of closure was modified to allow only work necessary to preserve or maintain the mine.

The order of closure No. MRM0004390 was modified on April 23, 2008, to allow the company to conduct preshift examinations of the 001 active section and for company officials to remove the Joy 10-SC shuttle car and Joy continuous mining machine from the face area of the No. 7 entry and to allow the installation of permanent roof supports in unsupported cuts, except for the No. 7 entry face area.

The Order of Closure No. MRM0004390 was corrected on April 24, 2008. The accident investigation on the 001 Active Section was completed.

The 001 Active Section was allowed to return to normal mining operations pending completion of training of all mining personnel on the approved Roof Control Plan. The approved Roof Control Plan for the mine was revised on April 29, 2008, by Division of Mines (DM) and Mine Safety and Health Administration (MSHA) officials. Training of all mining personnel on revisions of the approved Roof Control Plan was conducted on April 29 – 30, 2008.

Notice of Violation No. MRM 0004389 was issued on May 16, 2008, under 45.1-161.202(E), of the Coal Mine Safety Laws of Virginia for failure of the mine operator to comply with the Emergency Response Plan, Section I (No. 2). The DM was not contacted promptly (within fifteen minutes) after it had been determined that an accident, as defined by the Coal Mine Safety Laws of Virginia, Section 45.1-161.8, had occurred.

There were three (3) other violations issued as a result of personnel interviews and a spot inspection of the 001 Section which did not contribute to the accident.

RECOMMENDATIONS

1. Spherical washers should be provided for roof bolts installed on pattern to compensate for the degree of angles in bolt installations.

2. All miners should receive regular training on the approved roof control plan and roof control safety issues.

3. Thorough roof/rib examinations and evaluations should be conducted by all affected mining personnel at all times and especially when the mine roof encounters transition zones, high angled slips, and fractured roof.
4. Exposure of miners in the dynamic areas of operation of the continuous mining machine should be limited to the extent possible.

5. Due to the findings from the MSHA Approval and Certification Center and Matco, Inc. involving the most likely explanation of the bolt mechanism failure, a complete review of the American Society for Testing Materials (ASTM) standard should be taken to address improvements in the specifications which will improve the fracture toughness properties of the steel used in the manufacture of mine roof bolts.

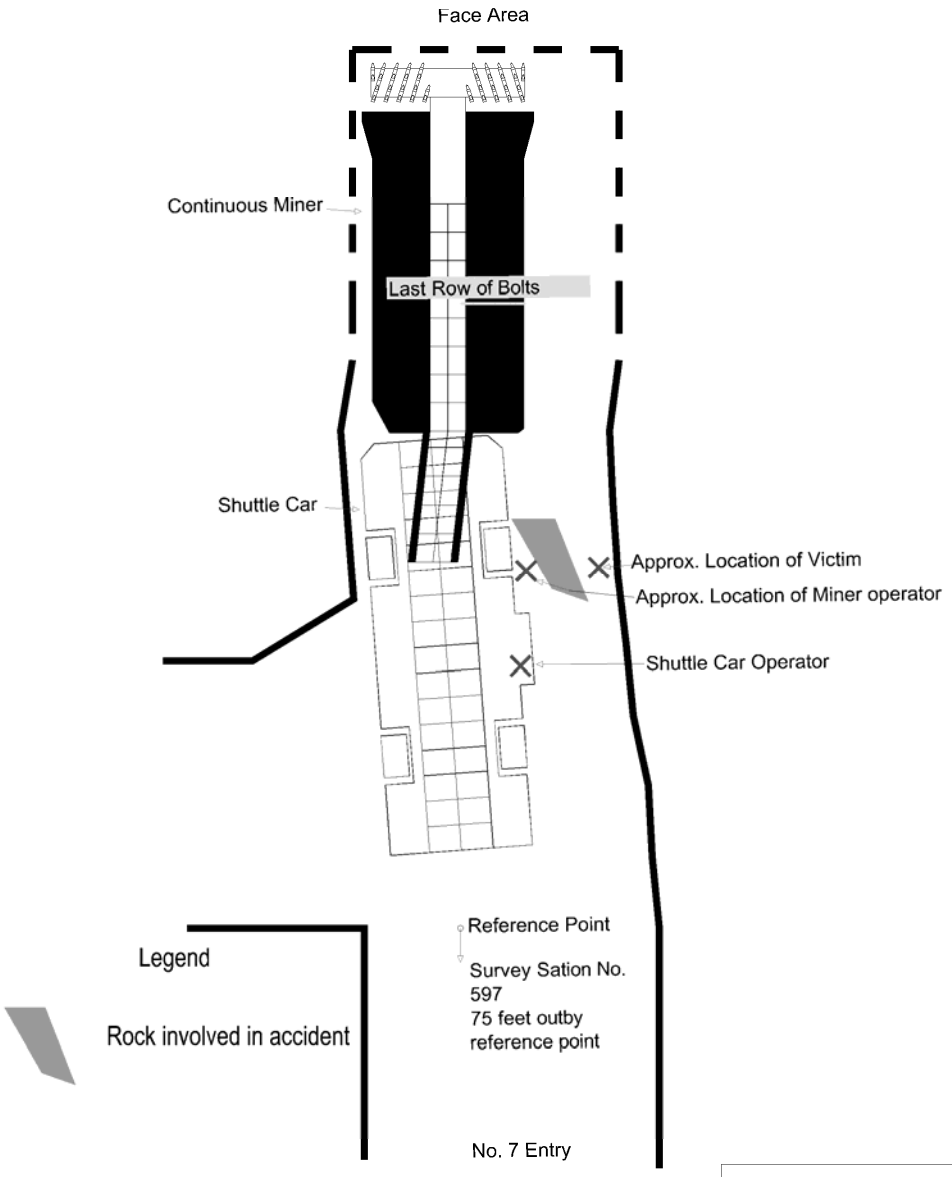
SIGNATURE SHEET

This report is hereby submitted by Randy Moore and approved by Frank A. Linkous.

Randy Moore, Coal Mine Inspector **Date**

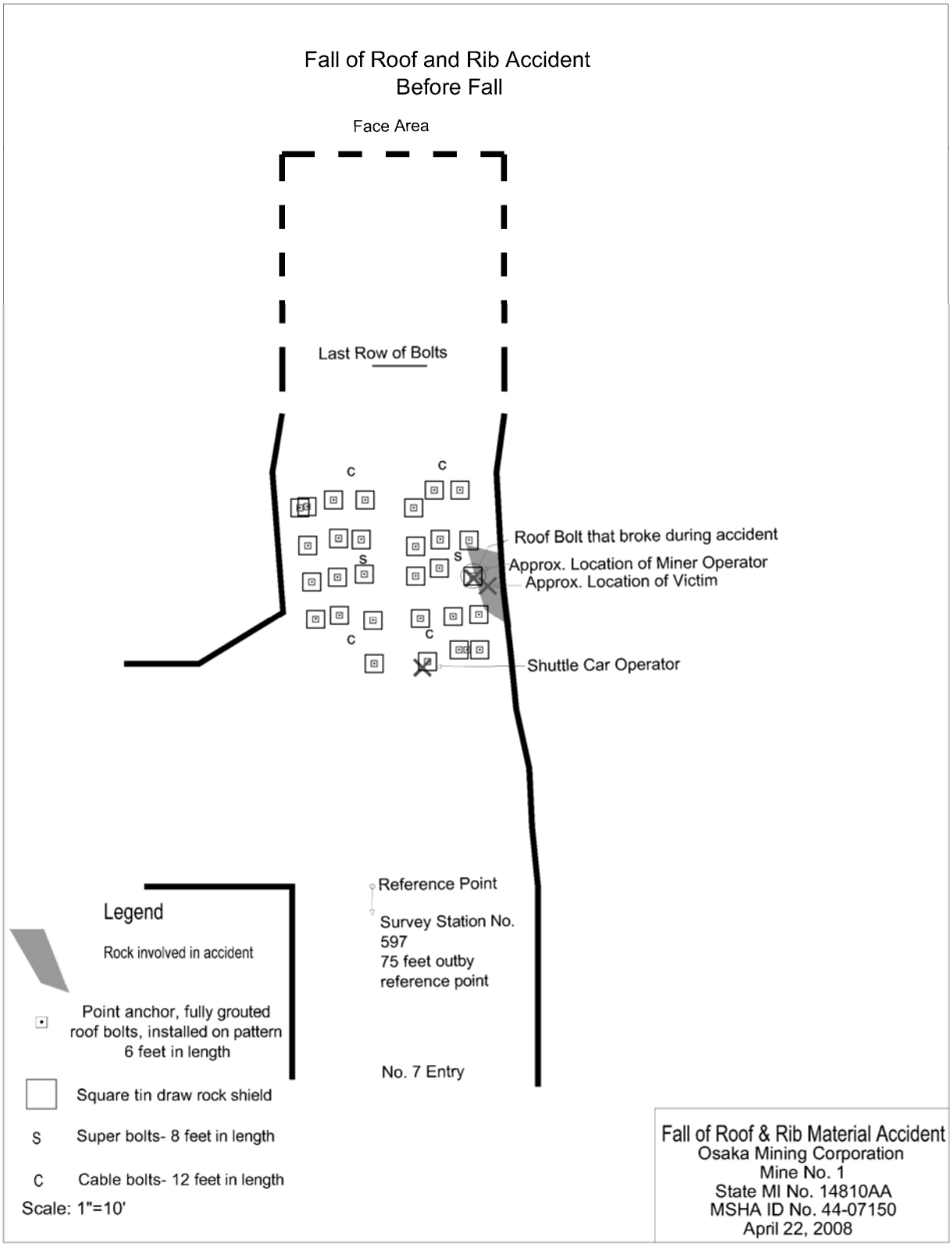
Frank A. Linkous, Chief **Date**

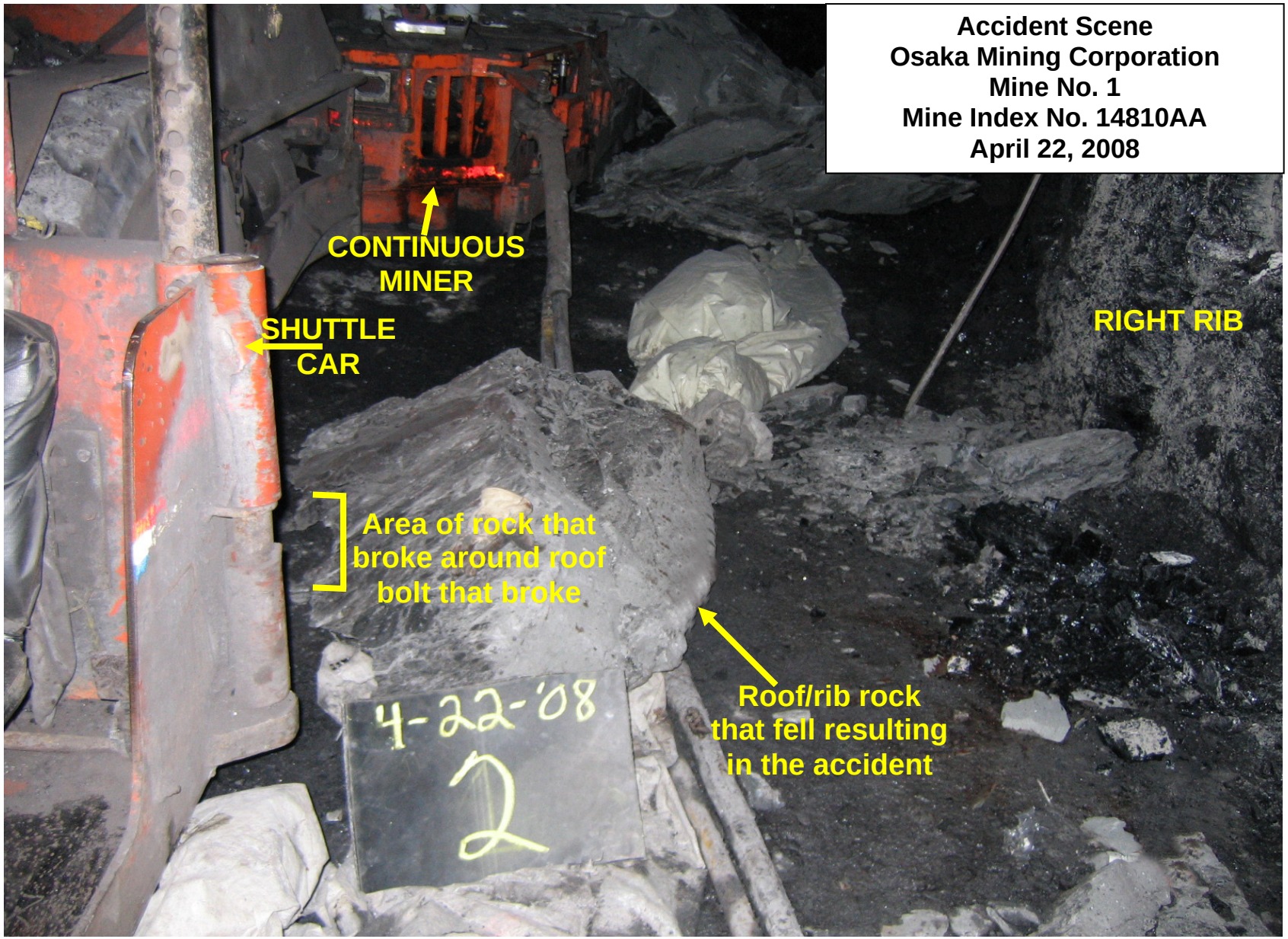
Fall of Roof and Rib Accident
After Fall

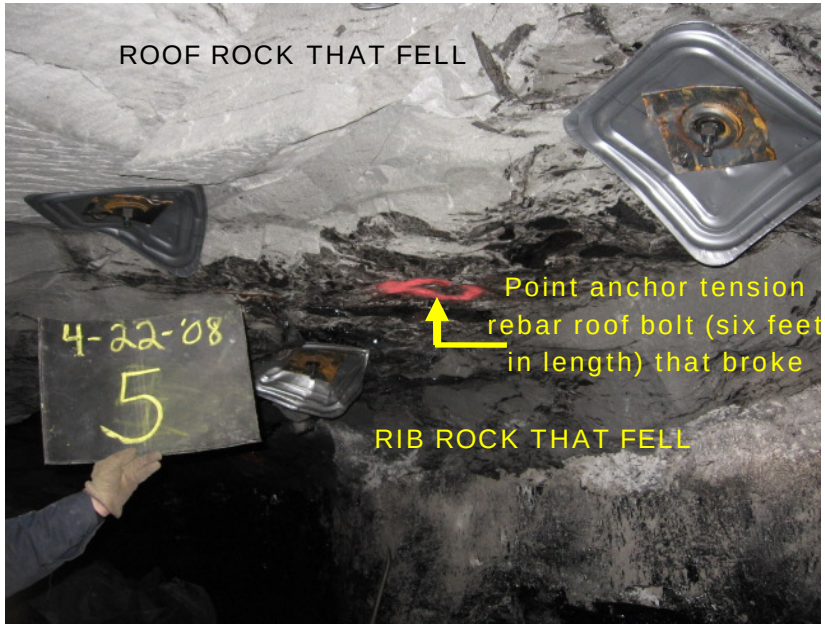


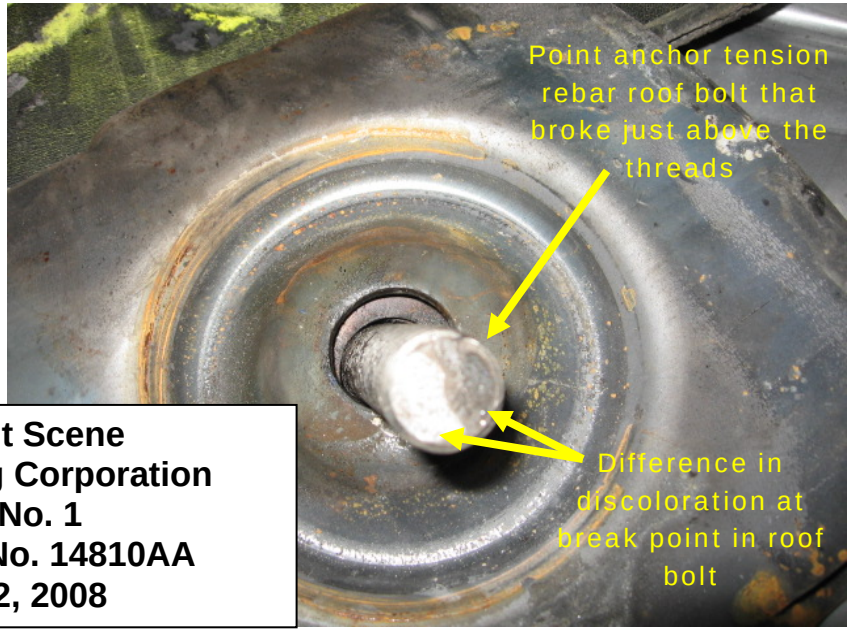
Scale: 1"=10'

Fall of Roof & Rib Material Accident
Osaka Mining Corporation
Mine No. 1
MI No. 14810AA
MSHA ID No. 44-07150
April 22, 2008


Fall of Roof and Rib Accident
Before Fall
Face Area
Last Row of Bolts
C
C
S
S
C
C
Roof Bolt that broke during accident
Approx. Location of Miner Operator
Approx. Location of Victim
Shuttle Car Operator
Reference Point
Survey Station No.
597
75 feet outby
reference point
No. 7 Entry
Legend
Rock involved in accident
Point anchor, fully grouted roof bolts, installed on pattern 6 feet in length
Square tin draw rock shield
S Super bolts- 8 feet in length
C Cable bolts- 12 feet in length
Scale: 1"=10'
Fall of Roof & Rib Material Accident
Osaka Mining Corporation
Mine No. 1
State MI No. 14810AA
MSHA ID No. 44-07150
April 22, 2008


Accident Scene
Osaka Mining Corporation
Mine No. 1
Mine Index No. 14810AA
April 22, 2008
CONTINUOUS MINER
SHUTTLE CAR
RIGHT RIB
Area of rock that broke around roof bolt that broke
4-22-'08
2
Roof/rib rock that fell resulting in the accident





Accident Scene
Osaka Mining Corporation
Mine No. 1
Mine Index No. 14810AA
April 22, 2008

APPENDIX

VICTIM DATA SHEET

PERSONS PRESENT DURING THE INVESTIGATION

MINE LICENSE INFORMATION

ADDENDUM #1

VICTIM DATA SHEET

Name:	David Sizemore
Occupation:	Roof Bolting Machine Operator
Mailing Address:	Rt. 2 Box 383 Big Stone Gap, Virginia 24219
Date of Birth:	October 4, 1946
Total Mining Experience:	Approximately 30 years
Experience with Present Company:	Eleven years and two months
Employment at Present Operation:	Two years and three months
Certification History:	Underground Electrical Repairman Underground General Coal Miner Gas Detection

PERSONNEL

The following personnel provided information and/or were present during the investigation:

OSAKA MINING CORPORATION

Hagy Barnett	Superintendent
Kenneth Ronald Turner	Section Mine Foreman – Third Shift
John Mullins	Section Mine Foreman – Day Shift
Marvin Music	Continuous Mining Machine Operator
Roger McCoy	Shuttle Car Operator
Dennis Gibson	Shuttle Car Operator
Christopher Huff	Roof Bolting Machine Operator
Curtis Fleenor	Roof Bolting Machine Operator
Walter Gibson	Roof Bolting Machine Operator
Edward Dorton	Roof Bolting Machine Operator
Jerry Long	Roof Bolting Machine Operator – Third Shift
Derrick Collins	Roof Bolting Machine Operator – Third Shift
Eric Stallard	Utilityman
Charles Fields, Jr.	Section Repairman
James Ramey II	Battery Scoop Operator

CUMBERLAND RESOURCES CORPORATION

Rick Craig	Vice President of Operations
Tom Asbury	Safety Director
Larry Coeburn	Safety Analyst
Forrest Lambert	Safety Analyst

COUNSEL FOR CUMBERLAND RESOURCES CORPORATION

Marko Rajkovich	Rajkovich, Williams, Kilpatrick & True, PLLC
Stephen Hodges	Stuart Penn Eskridge, Inc. (Penn Stuart)

MINE SAFETY AND HEALTH ADMINISTRATION

Ray McKinney	District Manager, District 5
Nick Rasnick	Assistant District Manager, Inspection Division
Hagel Campbell	Coal Mine Safety &Health Inspector (Ventilation)
Russell Dresch	Electrical Engineer
Ben Harding	Conference Litigation Representative
David Smith	Coal Mine Safety &Health Inspector (Roof Control)
Johnny Turner	Coal Mine Safety &Health Inspector (Roof Control)
Fred Martin	Educational Field Services Specialist

VIRGINIA DIVISION OF MINES

Frank Linkous	Chief, Division of Mines
Carroll Green	Mine Inspector Supervisor
John Thomas	Mine Inspector Supervisor
Gary Cutting	Coal Mine Technical Specialist
Randy Moore	Coal Mine Inspector
Sammy Fleming	Coal Mine Inspector
Hershiel Hayden Jr.	Coal Mine Inspector
Jerry Scott	Coal Mine Inspector
Mike Willis	Mine Safety Engineer

MINE LICENSE INFORMATION

Official Corporation	Osaka Mining Corporation
Official Business Name of Operator	Osaka Mining Corporation
Person with Overall Responsibility	Hagy E. Barnett
Person in Charge of Health and Safety	Hagy E. Barnett

ADDENDUM #1

Summary of August 26 Meeting With Matco Laboratory

Attendees: Joseph M. Turek, Manager, Materials Group, Matco Laboratory
Kenneth A. Sproul, Chief, Quality Assurance and Materials Testing Division, MSHA A&CC
Donald P. Peiffer, Quality Assurance and Materials Testing Division, MSHA A&CC
Joseph A. Cybulski, Chief, Roof Control Division, MSHA PS&HTC
Joseph F. Judeikis, Acting Chief, Applied Engineering Division, MSHA A&CC (via telephone)

Purpose: To discuss the Matco report of the failure investigation of a mine roof bolt that resulted in a fatal injury to a miner at Osaka Mining, Mine #1 in District 5 that occurred on April 22, 2008.

Background: Preliminary examination of the failed roof bolt at A&CC 's laboratory with a stereomicroscope indicated two distinct regions of fracturing across the surface of the bolt. The beach markings and indications of plastic deformation in one region suggested the possibility of a ductile fracture event while the other region evidenced a faceted surface texture consistent with a brittle failure. It was determined that further evaluation by a competent metallurgical laboratory using an electron scanning microscope and other analytical techniques was required to further characterize the nature of the fracturing. Subsequently, Matco Associates, Inc. of Pittsburgh, PA was retained to assist with the investigation. The Matco report dated July 29, 2008 presented a failure mode analysis along with recommendations for improving the specifications in ASTM F432-95 which is invoked in 30CFR75.204. MSHA review of the Matco report raised several questions regarding the underlying assumptions in the report which led to the determination that a face to face meeting with Matco would be a productive way in which to resolve any misconceptions and clarify the rationale for the recommendations.

Discussion: The discussion focused on several key issues as follows:

1. **Was Matco's analysis based on the assumption of a constant static tensile load on the bolt?** If so, the analysis may not have taken into consideration the dynamic nature of the typical mine roof in which movement in the roof strata can impart instantaneous cantilevered loads which can approach the ultimate breaking load of the bolt. Matco stated

that while they are not completely familiar with underground mining they did understand something of the dynamic nature of the mine roof and that their conclusion about the mode of failure of the bolt would be the same under static or dynamic loading conditions. Namely, they believe that a large notch defect was introduced during installation; that the defect resulted from bending due to uneven roof conditions; further bolt tightening increased the crack size (i.e., contact between the square nut edges and the washer and bearing plate combination induced additional impact bending moments); during installation, the bolt temperature was likely higher than the ambient mine temperature but as the bolt temperature reached thermal equilibrium with the mine environment, fracture toughness was reduced and a brittle fracture occurred.

2. **How can Matco be sure that that the notch defect in the failed bolt occurred during installation?** Matco indicated that the evenly spaced ridges (beach marks) in the notch area provide evidence of repetitive cyclic loading of nearly uniform intensity that is characteristic of what would occur due to the installation forces that result while installing the bolt at an angle relative to the immediate roof contact area and imparting bending moments each time the square nut corners come in contact with the washer and bearing plate combination. These ductile, plastic deformations would be expected to be more random in nature if they were caused by vibration from the roof, being struck by a miner or shuttle car, etc. Further, the threaded portion of the failed bolt and the other bolt samples which were tensile tested at PS&HTC showed evidence of thread root cracks primarily in the bend areas. This is more likely to occur when the steel has been cold worked. Although cold rolling the threads is not a problem in itself, it does reduce the plastic deformation limits of the material.

3. **Why does Matco believe that enhancements should be made to the ASTM standard?** Although the yield load and ultimate load limits of the standard are adequate for the intended service, Matco believes that fracture toughness properties are not adequately addressed by the standard. There are several key areas which should be improved to better control the chemical and mechanical properties of the steel. The mechanical properties of Table 3 of the standard should be strictly adhered to rather than simply allowing bolts that meet the overall strength requirements provided in Table 4 of the standard to suffice. The chemical properties in terms of non-metallic inclusions should be tighter, particularly for sulfur. Better controls on melt practice during the steel manufacturing process is necessary to assure that the steel is properly deoxidized and will be less prone to oxide inclusions and voids. This

practice is called "killing" the steel. The term indicates that the steel has been completely deoxidized by the addition of an agent such as silicon or aluminum, before casting, so that there is practically no evolution of gas during solidification. Killed steels are characterized by a high degree of chemical homogeneity and freedom from porosity. Each of these and possibly some other additions to the specifications would reduce the DBTT (ductile to brittle transition temperature) which should never be in the same range as the normal service temperature.

4. **The Matco report suggests that other bolts from the same heat or lot should be considered susceptible to failure by brittle fracture and should no longer be used for service.** While the statement is true with regard to susceptibility of failure by brittle fracture, this mode of failure would be dependent upon a series of worst case conditions that may not be representative of the typical case. The presence of thread root cracks compounded by potential non-metallic inclusions in the steel at the same point and a notch defect being induced by installation of a bolt at an angle would all have to occur. Tens of millions of roof bolts are installed in underground coal mines every year. While there have been isolated cases of bolt failures associated with relatively small pieces of rock (as was the case at Osaka Mining); it is an extremely improbable event. Further, the bolts which were tensile tested did comply with the strength requirements of the standard.

Conclusions: Tech Support concludes the following from the Matco report and the follow-up discussions from the meeting:

1. The Matco failure analysis is a plausible explanation of the mode of failure of the Osaka Mine bolt.

2. The bolts from this lot meet the applicable ASTM standard (ASTM F432-95). There is not sufficient evidence to warrant removing bolts from this lot from service.

3. The fracture toughness properties of mine roof bolts can and should be improved through a complete review of the standard and the adoption of better controls on chemical and mechanical properties and deoxidation of the steel.

Interim Actions:

1. The most likely explanation of the bolt failure mechanism, based on the evidence, involves a notch defect that may have been introduced during installation of the bolt at an angle. **Technical Support will assist CMS&H to develop an information bulletin to the industry to emphasize the importance of the use of angle compensating devices required by 75.204(f)(8) to mitigate against the possibility of notch defects occurring during installation.**

2. Since the physical evidence suggests the possibility of the bolt failure being due, in part, to bending during installation, there may be the potential that other bolts installed at this mine were also significantly bent upon installation which may have induced fractures thereby weakening them. It might be prudent to consider reviewing a representative sample of bolt installations at this mine to get a feel for potentially bent bolts by looking at the attitude of the bearing plates. Additionally, bolter operators at the mine should be retrained or otherwise made clearly aware of the importance of proper installation techniques and the potential consequences of tightening the bolt against excessively angled roof orientations.

Long Term Actions: A complete review of the ASTM standard should be undertaken to address improvements in the specifications which will improve the fracture toughness properties of the steel used in the manufacture of mine roof bolts.

ASTM F 432-95 is a voluntary consensus standard developed by roof support manufacturers for the mining industry. The current version has been in effect since 1995 but it is currently being revised by a working group comprised of all of the US and some of the foreign manufacturers of roof support products. **Technical Support will bring the Matco report and the associated concerns to the attention of the working group members for their consideration as they work to revise the standard.**