

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

REPORT OF INVESTIGATION

**Surface Nonmetal Mine
(Crushed Stone)**

**Fatal Powered Haulage Accident
May 27, 2008**

**Lake Herman Quarry
Syar Industries Inc.
Vallejo, Solano County, California
Mine ID No. 04-00726**

Investigators

**Ronald J. Jacobsen
Supervisory Mine Safety and Health Inspector**

**Stanley T. Schaeffer, Jr.
Civil Engineer**

**Isabel Williams
Mine Safety and Health Specialist**

**Originating Office
Mine Safety and Health Administration
Western District
2060 Peabody Road, Suite 610
Vacaville, California 95687
Arthur L. Ellis, District Manager**

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OVERVIEW

William D. Hall, haul truck driver, age 52, was fatally injured on May 27, 2008. He backed a truck to dump a load of material on top of a stockpile and the ground failed. The truck rolled over the edge and fell vertically approximately 30 feet landing upside down at the bottom of the stockpile.

The accident occurred because management policies and procedures used to dump and load out material at the stockpile was inadequate. The angle of repose at the stockpile was steep because a front-end loader removed material at the bottom making the dump location unstable.

The victim was not wearing a seat belt which contributed to the severity of his injuries.

GENERAL INFORMATION

Lake Herman Quarry, a surface crushed stone operation, owned and operated by Syar Industries Inc., was located in Vallejo, Solano County, California. The principal operating official was Michael Burneson, plant manager. The mine operated two 8-hour shifts per day, five days per week. Total employment was 47 persons.

Rock was drilled and blasted from a multi-bench quarry. Front-end loaders loaded the material onto trucks that transported it to stockpiles. Some of the material was hauled to a primary crusher. Finished products were sold for construction material.

The last regular inspection at this operation was completed on February 21, 2008.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, William D. Hall (victim) reported for work at 6:00 a.m., his normal starting time. Hall attended a safety meeting, received his assignment, and then operated a truck to transport material from the quarry to the stockpiles.

Hall was transporting material to two stockpiles referred to as the One Way stockpile and the Scalper stockpile. He dumped approximately five loads on the One Way stockpile and several others on the Scalper stockpile prior to the accident. About 10:48 a.m., Hall drove his loaded truck to the top of the One Way stockpile and backed into position to dump the load when the ground failed.

Kevin Darst, front-end loader operator, was dumping a bucket load of material into the primary crusher when he heard a noise and saw Hall's truck lying upside down. Darst, Robert Gordon, water truck driver, and Lee Deming, front-end loader operator, immediately went to assist Hall. Cardiopulmonary Resuscitation (CPR) was administered until emergency medical personnel arrived.

The victim was transported to a local hospital where he was pronounced dead at 11:49 a.m., by the attending physician. Death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

On the day of the accident, the Mine Safety and Health Administration (MSHA) was notified at 11:07 a.m., by a telephone call from William Berglof, safety manager, to Bruce Allard, supervisory mine safety and health inspector. An investigation was started the same day.

An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA's accident investigation team traveled to the mine, made a physical inspection at the accident scene, interviewed employees, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees.

DISCUSSION

Location of the Accident

The accident occurred on the One Way stockpile located about 0.3 miles from the pit and about 100 feet from the primary crusher.

Stockpile

The stockpile where the accident occurred was arc shaped and approximately 196 feet long and 30 feet high. The dumping area on the top of the stockpile was approximately 40 feet wide. The top surface of the stockpile was generally flat with a haul road sloping off to the south-southeast. The northern edge of the stockpile had a partial one to two feet high berm on either side of the location of the accident. A section of crest material was lost during the slope failure.

The stockpile was constructed of fill material over top of natural ground that created an elevated work area. The fill material consisted of sands, silts, and gravel. Cobble-sized stones and larger rocks greater than 24 inches were also in the matrix.

The typical procedure was to allow trucks to dump material over the stockpile edge while a front-end loader removed material at the toe of the stockpile. This practice created a hazardous condition for trucks dumping material at the top of the stockpile as a result of the slope of the stockpile face being increased.

Haul Truck

The truck involved in the accident was a 2002 Caterpillar model 775D rigid frame equipped with a dump body. The engine was a Caterpillar model 3412 diesel coupled to a Caterpillar automatic transmission with seven forward speeds and one reverse speed. The truck had a Roll-Over Protective Structure (ROPS) which appeared to sustain only minor deflection that did not compromise the operator's work area.

The truck weighed approximately 104,850 pounds empty and had a payload of 130,150 pounds for a total Gross Vehicle Weight of approximately 235,000 pounds. Reportedly the truck was loaded with three, less than full, buckets of raw material from Caterpillar 992G front-end loader. Three full buckets of material weighed approximately 114,000 pounds.

The truck's supplemental and main steering systems were inspected, tested, and determined to be intact.

The air system did sustain some damage during the accident. The double check valve for the front brake relay was broken. After the check valve was replaced, a brake test was conducted on the service, parking and emergency brakes. The brakes functioned normally when tested.

The mid-axle height of the truck was approximately 40 inches. The hydraulic lifting rams were intact and operational. The transmission was found in neutral with the park brake set.

Stockpile Failure

After the accident, a ledge of over-steepened material remained immediately adjacent to the stock pile failure. This material extended laterally approximately 2-3 feet from the scarp edge and had a height of approximately 13 feet. The slope of this material was over-steepened to about 78°.

Investigators used photographs and measurements taken at the site to project a section of the over-steepened material in a general west-east direction. They determined that this over-steepened ledge of material would have been constant across the area where the slope failure occurred. This ledge of material was marginally stable and failed when horizontal and vertical forces were induced by the rear wheels of the truck as it backed to this area.

Cross-sections measured at the stockpile in the vicinity of the failure zone had overall post-failure slope angles ranging from 32° to 46° (toe to crest). The lower sections of the slope were generally flatter and the upper sections of the slope were generally steeper. The fill material comprising the stockpile had been compacted over time due to truck traffic. This material contained a significant amount of gravel and sand that appeared not to be completely dry. However, the moisture content of the fill material was unknown. The fine fraction of the material was considered to be non-plastic. Therefore, the material would be classified as cohesion-less, i.e., that the internal strength of the material was mainly attributed to confinement and friction. This was also supported by the observation that the stockpile contained a significant percentage of coarser sized material.

It is also likely that negative pore water pressures within the fine fraction of the soil created matrix suction forces that gave the soil an apparent cohesive strength. The inclusion of this apparent cohesive strength and confinement from compaction allowed the slope at the stockpile to temporarily maintain an angle greater than the angle of repose prior to being loaded by the rear wheels of the truck. Temporary strength was compromised once the additional loading of the rear wheels of the truck was applied to the over-steepened material and the material subsequently failed.

No tension cracks were observed at the crest of the stockpile after the slope failure. Slope stability analyses were subsequently performed using representative pre-accident condition parameters to verify the failure scenario. A friction angle of 32° was selected based on measured slope angles and the general make-up of the material comprising the stockpile. The slope stability analyses indicate that over-steepening of the slope resulted in a lower resistance to slope failure. This failure scenario showed that a cohesive strength of 350 pounds-per-square-foot (psf) was required to maintain slope

stability with a rear wheel loading of 70,250 pounds (67 percent of the trucks empty 104,850 pounds gross vehicle weight rating - GVWR) applied to the over-steepened section. This rear wheel loading occurred at a GVWR of 104,850 pounds.

Investigators determined that it was unlikely the material in the over-steepened section possessed the 350 psf of cohesive strength required to maintain slope stability even with the lower GVWR. During slope failure, the rear-end of the truck dropped over the scarp. The truck's downward and horizontal momentum caused it to tip and flip over onto its cab. The remaining portion of the slope at the stockpile crest after the failure was in the general shape of the truck's dual rear wheels.

Seat Belt

After the accident, the victim was found in the cab lying on the roof of the over turned truck. The seatbelt was not fastened. The seatbelt was tested and functioned properly.

Weather

On the day of the accident, the weather was sunny with clear skies and a temperature of approximately 70 degrees Fahrenheit. When the accident occurred the sunlight was approximately eleven-o'clock in the sky and would not have limited the victim's visibility. Weather was not considered to be factor in the accident.

Training and Experience

William Hall had 1½ years mining experience and operated a truck for 33 weeks. He received training in accordance with 30 CFR, Part 46.

ROOT CAUSE ANALYSIS

A root cause analysis was performed and the following root causes were identified:

Root Cause: Management policies and procedures were inadequate and failed to ensure that persons operating haul trucks could safely dump on the One Way stockpile. The edge of the stockpile was cut steep at approximately a 78 degree angle because material was removed from the toe of the stockpile at the same time that trucks were dumping at the top.

Corrective Action: Management should implement policies and procedures to ensure that persons operating trucks could dump safely. Slope stability should be corrected as ground conditions warrant. The procedures should ensure that no material is removed while trucks are dumping. Loads of material should be dumped a safe distance back from the edge of the stockpile and pushed over with a dozer.

Root Cause: Management policies were inadequate and failed to ensure that truck drivers wore seat belts that were provided.

Corrective Action: Management should implement policies and procedures to ensure that truck drivers wear seat belts when operating mobile equipment. Persons should be monitored as often as necessary to ensure these policies are being followed.

CONCLUSION

The accident occurred because management policies and procedures used to dump and load out material at the stockpile was inadequate. The angle of repose at the stockpile was steep because a front-end loader removed material at the bottom making the dump location unstable.

The victim was not wearing a seat belt which contributed to the severity of his injuries.

ENFORCEMENT ACTIONS

Order No. 6370094 was issued on May 27, 2008, under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred at this operation on May 27, 2008, when a haul truck driver backed over the edge of a stockpile. This order is issued to ensure the safety of persons at this operation and prohibits any work in the affected area until MSHA determines that it is safe to resume normal operations as determined by an Authorized Representative of the Secretary of Labor. The mine operator shall obtain approval from an Authorized Representative for all actions to recover and/or restore operations in the affected area.

This order was terminated on May 30, 2008, after conditions that contributed to the accident no longer existed.

Citation No. 7975827 was issued on August 1, 2008, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 56.9304(b):

A fatal accident occurred at this operation on May 27, 2008, when a miner operating a loaded haul truck was in the process of dumping a load on top of the One Way Stockpile. The ground gave way and the truck fell off the edge of the stockpile approximately 30 feet and landed upside down. A front-end loader had been loading from the toe of this stockpile for approximately 4 hours prior to the accident. The mine had an accepted practice of dumping over the edge on top of stockpiles when a front end loader was mining the toe of the stockpile. Management traveled in the area approximately 30 minutes before the accident

and failed to instruct the truck drivers to dump a safe distance from the edge of the dump. Management engaged in more than ordinary negligence in that he failed to insure the truck drivers were dumping a safe distance from the edge of the stockpile. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on August 1, 2008. Management established policies and procedures requiring truck drivers to dump a safe distance from the edge in areas where the ground is unstable. All persons have been instructed in the new policies and procedures.

Citation No. 7975828 was issued on August 1, 2008, under the provisions of Section 104(a) of the Mine Act for a violation of 56.14131(a):

A fatal accident occurred at this operation on May 27, 2008, when a miner operating a loaded haul truck was in the process of dumping a load on top of the One Way Stockpile. The ground gave way and the truck fell off the edge of the stockpile approximately 30 feet and landed upside down. A front-end loader had been loading from the toe of this stockpile for approximately 4 hours prior to the accident. During rescue efforts the victim was found not wearing a seat belt.

This citation was terminated on August 1, 2008. All persons were given additional training regarding the use of seatbelts while operating mobile equipment. Persons will be monitored as often as necessary to ensure seat belts are being worn as required.

Approved by:

Arthur L. Ellis
District Manager

Date

APPENDICES

- A. Persons Participating in the Investigation**
- B. Victim Information**
- C. Maps**

APPENDIX A

Persons Participating in the Investigation

Syar Industries Inc.

Michael Burneson	plant manager
William Berglof	safety manager
David Nunes	assistant plant manager
Robert D. Peterson	law corporation

Mine Safety and Health Administration

Ronald J Jacobsen	supervisory mine safety and health inspector
Stanley T. Schaeffer, Jr.	civil engineer
Isabel Williams	mine safety and health specialist

APPENDIX B

Accident Investigation Data - Victim Information

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



Event Number: 1 1 3 3 1 1 7

Victim Information: 1

1. Name of Injured/III Employee: <i>William D. Hall</i>		2. Sex <i>M</i>	3. Victim's Age <i>52</i>	4. Last Four Digits of SSN:	5. Degree of Injury: <i>01 Fatal</i>
6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 05/27/2008 b. Time: 11:03</i>				7. Date and Time Started: <i>a. Date: 05/27/2008 b. Time: 6:00</i>	
8. Regular Job Title: <i>176 Haul Truck Driver</i>		9. Work Activity when Injured: <i>055 Stock Piling Material</i>			10. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
11. Experience a. This Years Weeks Days Work Activity: <i>0 33 0</i>		b. Regular Job Title: Years Weeks Days <i>0 33 0</i>		c. This Mine: Years Week Days <i>1 47 5</i>	
12. What Directly Inflicted Injury or Illness? <i>076 Truck overturning</i>				13. Nature of Injury or Illness: <i>390 Blunt force trauma</i>	
14. Training Deficiencies: Hazard: <input type="checkbox"/> New/Newly-Employed Experienced Miner: <input type="checkbox"/> Annual: <input type="checkbox"/> Task: <input type="checkbox"/>					
15. Company of Employment:(If different from production operator) <i>Operator</i>			Independent Contractor ID: (if applicable)		
16. On-site Emergency Medical Treatment: Not Applicable: <input type="checkbox"/> First-Aid: <input checked="" type="checkbox"/> CPR: <input checked="" type="checkbox"/> EMT: <input type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>					
17. Part 50 Document Control Number: (form 7000-1)			18. Union Affiliation of Victim: <i>9000 Other not listed</i>		

Victim Information:

1. Name of Injured/III Employee:		2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:
6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:				7. Date and Time Started:	
8. Regular Job Title:		9. Work Activity when Injured:			10. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input type="checkbox"/>
11. Experience: a. This Years Weeks Days Work Activity:		b. Regular Job Title: Years Weeks Days		c. This Mine: Years Week Days d. Total Mining:	
12. What Directly Inflicted Injury or Illness?				13. Nature of Injury or Illness:	
14. Training Deficiencies: Hazard: <input type="checkbox"/> New/Newly-Employed Experienced Miner: <input type="checkbox"/> Annual: <input type="checkbox"/> Task: <input type="checkbox"/>					
15. Company of Employment: (If different from production operator)			Independent Contractor ID: (if applicable)		
16. On-site Emergency Medical Treatment: Not Applicable: <input type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>					
17. Part 50 Document Control Number: (form 7000-1)			18. Union Affiliation of Victim:		

Victim Information:

1. Name of Injured/III Employee:		2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:
6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:				7. Date and Time Started:	
8. Regular Job Title:		9. Work Activity when Injured:			10. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input type="checkbox"/>
11. Experience: a. This Years Weeks Days Work Activity:		b. Regular Job Title: Years Weeks Days		c. This Mine: Years Week Days d. Total Mining:	
12. What Directly Inflicted Injury or Illness?				13. Nature of Injury or Illness:	
14. Training Deficiencies: Hazard: <input type="checkbox"/> New/Newly-Employed Experienced Miner: <input type="checkbox"/> Annual: <input type="checkbox"/> Task: <input type="checkbox"/>					
15. Company of Employment: (If different from production operator)			Independent Contractor ID: (if applicable)		
16. On-site Emergency Medical Treatment: Not Applicable: <input type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>					
17. Part 50 Document Control Number: (form 7000-1)			18. Union Affiliation of Victim:		

APPENDIX C

