

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Surface Nonmetal Independent Shop
(Granite)

Fatal Machinery Accident
May 15, 2003

Salisbury Shop
Martin Marietta Aggregates
Salisbury, Rowan County, North Carolina
Mine I.D. No. 31-01235

Investigators

Larry R. Nichols
Supervisory Mine Safety and Health Inspector

Charles E. McDaniel
Mine Safety and Health Inspector

Walter C. Slomski
General Engineer

James Baker
Mine Safety and Health Specialist

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

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OVERVIEW

Allen K. Mills, master welder, age 51, was fatally injured when a portion of an unsecured steel unit he was assembling became unbalanced and fell on him. The steel unit was part of one side of a screen/conveyor tower that was being fabricated in the shop.

The accident occurred because the suspended steel unit had not been secured to prevent it from falling. A chain sling that had supported the unit had been removed and Mills was in the process of reattaching it when the unit fell. The unit was suspended on the flanges of two 6-inch beams when the accident occurred.

Mills had a total of 30 years, 3 months mining experience as a welder, all at this operation.

GENERAL INFORMATION

Salisbury Shop, an independent shop, owned and operated by Martin Marietta Aggregates, was located at 3825 Trexler Street, Salisbury, North Carolina. The principal operating official was William M. Sills, manager. The shop normally operated one 8-hour shift, 5 days a week. Total employment was 43 persons.

The shop facility served to repair, rebuild, fabricate, and warehouse parts for mining operations owned by Martin Marietta Aggregates. Repairs and fabrications often required employees to use heavy equipment to move units and/or parts of units that were heavy and awkward. Units were often fabricated in the shop, then transported to mine sites for installation.

The last regular inspection at this operation was completed April 23, 2003.

DESCRIPTION OF ACCIDENT

On the day of the accident, Allen Mills (victim) reported to work at about 7:00 a.m., his normal starting time. Mills and Joe Mahalick, welder, traveled to the shop assembly/erection area, where they were to work on a screen/conveyor tower that was being constructed. The day before the accident, two units had been assembled. Each unit consisted of one vertical beam attached to the ends of two horizontal beams.

On this day, both units were to be connected to a cross beam. While Mahalick went to cut some metal plates, Mills used the 15-ton crane to move the first unit from the staging area to the assembly area. He lowered the unit onto two surplus H-beams that had been placed with the web horizontal to the shop floor. These beams were positioned to elevate, support, and stabilize the units while they were being connected to the cross beam. The first unit was connected to the cross beam utilizing four bolts that Mills tightened by hand.

Mills then used the overhead crane to move the second unit to the assembly area. At about 8:30 a.m., Mahalick returned to the area and operated the crane while Mills disconnected the chain sling from the unit and attached it to the plate clamps (dogs) on the cross beam. Mahalick used the crane to raise the unbolted end of the cross beam into position to align the bolt holes with the unit.

When the holes did not align, they decided that the chain sling would need to be reattached to the unit's top horizontal beam to lift and reposition it. Mahalick moved the crane over the unit and Mills stood on the top flange of the unit's bottom horizontal beam and reattached the sling in a "choke" attachment to the upper horizontal beam. The positioning of the sling required Mills to work one-handed and hold onto the upper horizontal beam with the other hand to maintain his balance.

After the sling was hooked, Mills told Mahalick to bump the hoist and take out some slack. As the slack was being taken out, Mahalick stated that the unit Mills was standing on, shook and wobbled. Mills stepped down to look at the sling, then stepped back up on the beam, checked the sling, and instructed Mahalick to bump the hoist again. As the slack was being taken out, the chain came loose. The unit started to fall, causing Mills to lose his balance. He was thrown from the beam and pinned between the unit and the floor.

Jerry Watson, welder, was working nearby and saw the beam as it fell on Mills. He immediately ran to the office and told office personnel to call 911. Watson returned to the accident site where he and several other employees physically lifted the unit off Mills and blocked it against further movement. William Sills, manager, arrived at the scene and checked Mills for vital signs. Local emergency medical technicians arrived and provided medical assistance for approximately 15 minutes before transporting Mills to a local hospital. Mills was pronounced dead at the hospital as a result of multiple blunt force trauma injuries.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 11:15 a.m., on May 15, 2003, by a telephone call from Kevin S. Barnes, health and safety representative for Martin Marietta Aggregates, to Thomas P. Clarkson, acting supervisory mine safety and health inspector. An investigation was started that 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 investigators traveled to the mine, made a physical inspection of 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 at the assembly area in the welding shop. The shop floor was finished concrete and level. Illumination in the area was sufficient.

H-Beams

Prior to assembling the components for the screen/conveyor tower, two surplus H-beams (W6 x 20#) were placed on the shop floor 98 ½ inches apart with the web positioned horizontally. The beams measured 6 inches high, 6 ¼ inches wide, and 168 inches long. They were aligned to enable the units to be lowered onto them to be connected to a cross beam. The W6 beams were utilized to elevate the units while facilitating alignment and attachment of the cross beam.

Cross-Beam

The cross beam (W14 x 43#), that would be attached to the two units, was lying flat on the floor between and parallel to the two support H-beams. The beam measured 103 inches in length, 8 inches wide, 13 ⅝ inches high and weighed 369 pounds. It had been notched and drilled at both ends and was to serve as the cross member between the two units. The beam was rigged with two plate clamps (dogs) to facilitate lifting and moving the beam. Both ends of the beam were notched 11½ inches and drilled with six holes (three on the inside flange and three on the outside flange) for connection to the base beams (W12 x 72#) of each unit.

3-Beam Units

Two identical 3-beam steel units had been fabricated the day before the accident occurred. These units were to serve as part of a conveyor/screen tower and consisted of three individual components that had been welded together to form one unit:

The top horizontal beam (W14 x 43#) weighed about 412 pounds and measured $115\frac{1}{8}$ inches long, 8 inches wide, and $13\frac{5}{8}$ inches high.

The vertical beam (W14 x 43#) weighed about 461 pounds and measured $128\frac{3}{4}$ inches long, 8 inches wide, and $13\frac{5}{8}$ inches high.

The bottom horizontal beam (W12 x 72#), or base beam, weighed about 772 pounds and measured 12 inches wide, $12\frac{3}{8}$ inches high, and was $128\frac{3}{4}$ inches in length. The victim was standing on this beam at the time of the accident.

Both units were positioned on the support H-beams at the time of the accident. The top beam of each unit was directly above the bottom beam. The edge of the top beam was $72\frac{5}{8}$ inches above the top flange of the lower horizontal beam where the victim had been standing. The victim was reportedly 5 feet, 10 inches tall, which would have required him to reach up and over the top of the upper horizontal beam to attach the chain. It would have been difficult for him to visually check to ensure the hook was hooked into the chain, securing the unit.

Bolts

The bolts that were to be used to connect the cross beam to the 3 beam units were high-strength ATM A325 hex bolts, 1 inch in diameter, with $2\frac{3}{4}$ inch shanks. The bolts were to connect each end of the cross beam to the W12 x 72# beams (base unit) of the units. The unit that fell did not have any bolts installed when the accident occurred.

Center of Gravity Calculation of the 3-beam Units

Field measurements indicated the center of gravity for the 3-beam units to be on the X-axis (running along the horizontal floor W12 beam) at 43.14 inches and the Y-axis (running along the vertical W14 beam) at

37.78

inches. The X/Y axes intersection (0-point reference) being at the intersection of the center lines of the W12 beam on the shop floor and the vertical W14 beam, as positioned at the time of the accident. Centering the crane hook at the centerline and approximately 3 feet from the corner formed by the top side of the horizontal W14 beam and the vertical W14 beam would have provided balance when lifting the unit.

Shop Crane

The 15-ton overhead bridge crane, serial number 1557429-0, was manufactured by Lift-Tech International Crane and Hoist Operations and supplied by Mid-Atlantic Crane and Equipment Company. It was purchased by Martin Marietta Aggregates in November 1998. The crane was equipped with a 9/16-inch diameter wire rope, right-hand lay and an independent wire rope core. Breaking strength was 14.5 tons.

Management reported that the crane had been inspected monthly. During the investigation, the crane operated smoothly in the travel and hoist modes with no apparent problems. The employee operating the crane was familiar with the crane and had operated it frequently in the last three years.

Crane Hook

The crane hook, equipped with a latch, was manufactured by Crosby. Red dye penetrant observed on the hook indicated non-destructive testing had been done to reveal cracks. No damage to the hook was found during the investigation.

Chain Sling

The Herc-Alloy 800, 5/8 by 8-foot double chain sling, serial number AS1050-1, was manufactured by CM Chain, a Division of Columbus McKinnon Corporation. It had a load limit of 31,300 pounds. It was estimated that a double sling unit with an 8-foot reach would weigh approximately 78 pounds. The sling hook's throat measurement was approximately 2 inches with a depth of 4 inches. Inspection of the sling did not reveal any damage or defects.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following causal factors were identified:

Causal Factor: The chain sling used to lift and secure the unit was unhooked, leaving the unit unsecured and unstable while suspended at rest on the flanges of the two H-beams.

Corrective Action: A written plan or policy should be formulated regarding lifting and securing heavy components during fabrication and assembly. Employees that repair, maintain, fabricate, and assemble heavy components should be retrained in these procedures to ensure tasks are conducted safely.

Causal Factor: Work was performed while standing on the bottom beam of an unsecured and unstable unit. To rig the chain to the unit for lifting by the bridge crane, the victim had to position himself in such a manner that he would have been unable to visually verify that the hook was secured.

Corrective Action: Suspended, unsecured components should be blocked against motion to prevent persons from being exposed to hazards. A system should be implemented to ensure hooks are properly secured before attempting to lift loads.

Causal Factor: A risk assessment to determine possible hazards and establish safe work procedures was not conducted prior to conducting this task.

Corrective Action: Management should implement procedures that require risk assessments to be conducted to identify and eliminate hazards prior to performing maintenance or repair tasks.

CONCLUSION

The accident occurred when a metal unit of screen/conveyor tower that was being assembled had not been secured to prevent it from falling. A chain sling that had supported the unit had been removed and employees were in the process of reattaching it when the unit fell. The unit was suspended on the flanges of two 6-inch beams when the accident occurred.

VIOLATIONS

Order No. 6127366 was issued on May 15, 2003, under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred at this operation on May 15, 2003, when two miners were attempting to lift a sub-assembly for a screen tower. This order is issued to assure the safety of all persons at this operation. It prohibits all activity in the welding area until MSHA has determined that it is safe to resume normal mining operations in the area. The mine operator shall obtain prior approval from an authorized representative to recover and/or restore operations to the affected area.

This order was terminated on May 21, 2003. Conditions that contributed to the accident no longer exist.

Citation No. 6119815 was issued on June 11, 2003, under the provisions of Section 104(a) of the Mine Act for violation of 30 CFR 56.16009:

A welder was fatally injured at this operation on May 15, 2003, when he was struck by a steel unit that fell on its side. The unit had been fabricated by welding three H-beams together with a combined weight of about 800 pounds. During assembly, the unit was suspended by an overhead hoist and positioned on two steel beams that had been placed on the shop floor. Unable to align the bolt holes for attaching the unit to the cross beam, the victim attempted to

reattach the sling. As the hoist took up slack in the chain, the unit fell, striking the victim.

This citation was terminated on June 12, 2003. Employees have been retrained in proper procedures for hoisting and securing heavy loads. Employees have been instructed to ensure units and structures are properly blocked and secured to prevent them from falling.

Approved by: _____ Date:
Michael A. Davis
District Manager

APPENDIXES

- A. Persons Participating in the Investigation
- B. Persons Interviewed

APPENDIX A

Persons Participating in the Investigation

Martin Marietta Aggregates

William M. Sills	manager
James K. Roberts	shop manager
Gus Gaydick	shop foreman
Lloyd Hanson	director, safety and health
Kevin S. Barnes	health and safety representative
Joe Mahalick	welder
Jerry Watson	welder
Dale Miller	welder

North Carolina Department of Labor

James M. Spigner	mine safety and health representative
Mike Wortham	mine safety and health representative

Mine Safety and Health Administration

Larry R. Nichols	supervisory mine safety and health inspector
Charles E. McDaniel	mine safety and health inspector
Walter C. Slomski	general engineer
James R. Baker	mine safety and health training specialist

APPENDIX B

Persons Interviewed

Martin Marietta Aggregates

William M. Sills	manager
James K. Roberts	shop manager
Joe Mahalick	welder
Jerry Watson	welder