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

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Cement)

Fatal Machinery Accident

March 23, 2005

Brand Scaffold Builders, Inc.
Contractor I.D. No. D405
at
Holcim (US) Incorporated
Holcim (US) Incorporated Holly Hill Facility
Holly Hill, Orangeburg County, South Carolina
Mine I.D. No. 38-00014

Investigators

Wyatt S. Andrews
Supervisory Mine Safety and Health Inspector

Danny W. Wriston
Mine Safety and Health Inspector

Harold J. Wilkes
Mine Safety and Health Inspector

Eugene D. Hennen
Mechanical Engineer

Sharon A. Cook
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
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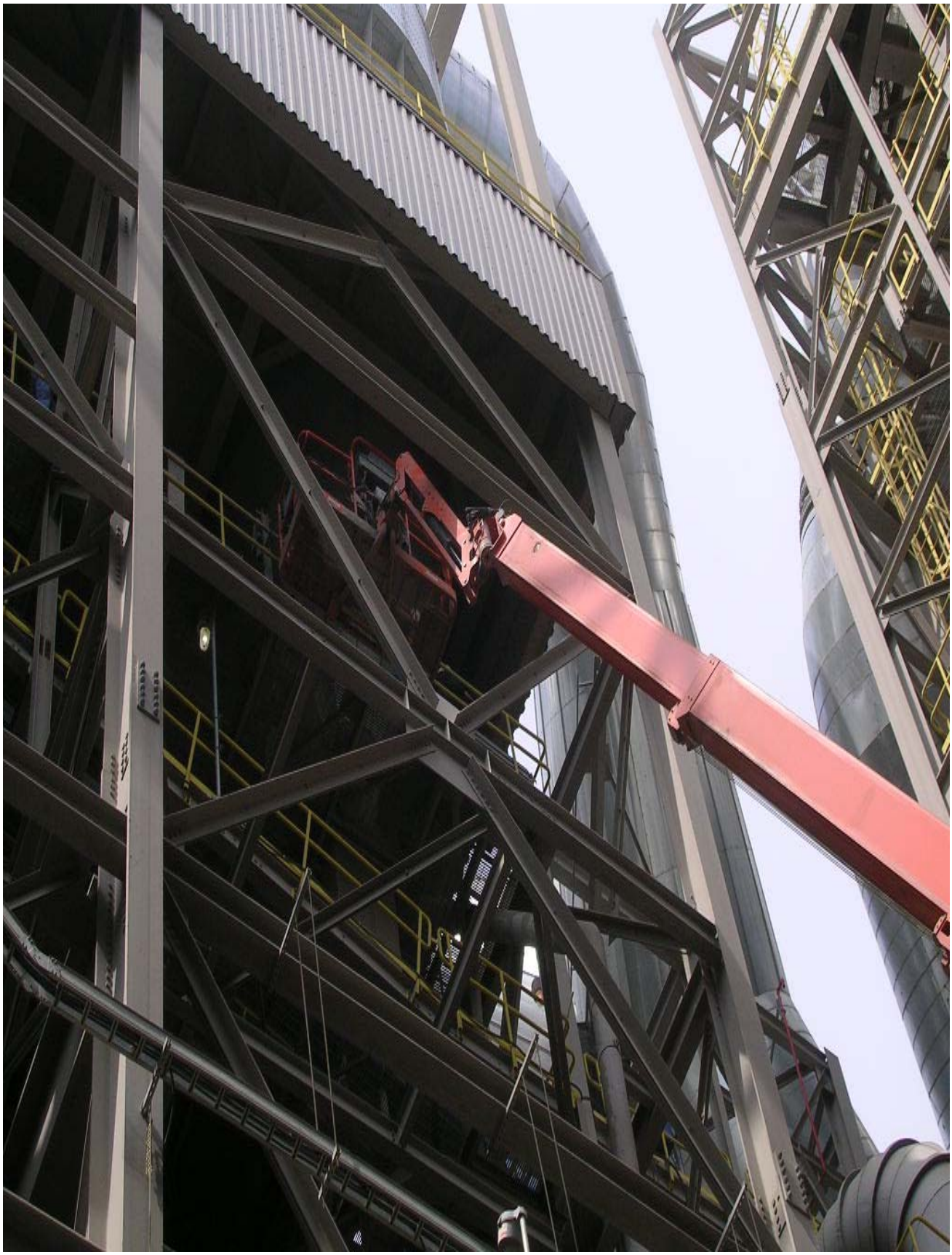

## OVERVIEW

Terry L. Pierce, laborer, age 34, was fatally injured On March 23, 2005, while operating an aerial platform. He was struck by a support beam and was pinned against the basket controls.

The accident occurred because Pierce was not trained to safely operate the aerial platform and had no previous work experience operating it. The foreman, who instructed the victim prior to the accident, had not been trained in the safe operation of the machine. Material stacked inside the basket restricted the victim's maneuverability while operating the controls for the machine. The locking device on the basket controls, which prevented accidental movement of the basket, was also inoperative.

## GENERAL INFORMATION

Holcim (US) Inc. Holly Hill Facility, a cement plant, owned and operated by Holcim (US) Incorporated (Holcim) was located in Holly Hill, Orangeburg County, South Carolina. The principal operating official was Chester Goodson, plant manager. The plant operated three, 8 hour shifts a day, 7 days a week. The quarry operated one, 8 hour shift a day, 5 days a week. Total employment was 210 persons.

Limestone was mined from a single bench using a continuous mining machine. The material was transported by conveyor belt to a primary crusher, where it was crushed and conveyed to the plant for processing into cement. The finished product was sold for use in the construction industry.

The last regular inspection for this operation was completed on March 17, 2005.

Brand Scaffold Builders, Inc. (Brand) was located in Ladson, South Carolina. The principal operating official was Steve Lacy, branch manager. Brand had been contracted by Holcim to supply, erect, and dismantle scaffolding at various locations at the Holly Hill facility. Total employment at the mine was 5 persons and the crew operated one, 8 hour shift per day, five days a week.

## DESCRIPTION OF THE ACCIDENT

On March 23, 2005, Terry L. Pierce, (victim) reported for work at Brand's office at 6:00 a.m., his normal starting time. Pierce; Chris Jackson, supervisor; and three other employees, Marcello Ochoa, Adrian Solis, and Ricardo Chapa, laborers, left the office and drove to the Holly Hill plant, arriving at 7:30 a.m. About 7:45 a.m., they met with Manuel Enciso, area coordinator for Holcim.

The crew was assigned the task of moving dismantled scaffolding from the upper floor, about 90 feet above the ground, of the raw mill building. The raw mill building consisted of an outer structure of steel beams with walkways and platforms constructed about eight feet inside the framework of the building at various levels.

The rubber tired, aerial platform was being used to bring the scaffolding material to the ground. The basket was raised to the 90 foot level with the operator on board. The operator would then maneuver the basket between the structural supports of the raw mill building and position the rear of the basket against the handrail.

Scaffolding structure was loaded into the basket, near the operator, and lowered to the ground.

At 9:00 a.m., Pierce received training on the aerial platform from Jackson. When Jackson finished explaining how the controls operated, he and Pierce climbed into the basket and raised it toward the top floor of the raw mill building.

The crew performed other work in the area until about 10:00 a.m. Jackson trammed the machine into place at the north side of the raw mill building. About 11:00 a.m., he told the crew to break for lunch. At 12:10 p.m., Jackson instructed Ochoa and Chapa to go to the upper floor and load scaffolding into the basket. He told Solis to remain on the ground while Pierce accompanied him in the basket to the 90 foot level.

Jackson and Pierce got into the basket and raised it to the 90 foot level. Jackson then exited and walked down the stairs to the ground level. Pierce stayed in the basket to operate the machine. Ochoa and Chapa loaded 16 steel walk board planks into the basket with Pierce.

After loading the material, Ochoa and Chapa left to perform other work. Pierce began moving the basket between the structural beams of the building. Pierce's back struck a beam and he was pinned against the control panel of the basket.

Jackson arrived at ground level, heard a noise from above, looked up, and saw that Ochoa and Chapa were gesturing with hand signals that the basket was stuck. Jackson immediately went to the ground controls of the machine. After several failed attempts to start the engine, he left and proceeded up the stairs of the building. When Jackson arrived at the 90 foot level, he saw Pierce pinned against the controls with his left hand near the controller of the basket and his right foot on the foot control switch. Jackson could not remove Pierce's foot from the control switch so he exited the basket and got help.

Steve J. Potts, a contractor employee working in the area, became aware of the emergency and rushed to the basket. He managed to remove Pierce's foot from the control switch, restarted the engine, move the machine slightly, and freed Pierce. Another employee lowered the basket from the machines' ground control position.

Other employees rushed to help Pierce but he was non-responsive. Emergency medical personnel arrived but could not revive Pierce.

The victim was pronounced dead at the scene by the coroner. Death was attributed to asphyxiation.

## INVESTIGATION OF THE ACCIDENT

Thomas P. Clarkson, supervisory mine inspector was notified of the accident at 1:10 p.m. on March 23, 2005, by a telephone call from John L. Jerrels, Holcim's safety director. An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners. An investigation was started the same day. MSHA's accident investigators traveled to the mine, made a physical inspection of the accident scene and equipment involved in the accident, conducted interviews, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management, employees, and personnel from several other contractors.

## DISCUSSION

### Accident Location

The accident occurred at the 90 foot level on the north side of the raw mill building, about eight feet from the work platform.

The aerial platform had been positioned between the raw mill building and a storage building. The area was level and the floor between the buildings was concrete. The machine was stationed parallel to the side of the raw mill building when the accident occurred.

Due to the configuration of the support structure of the raw mill building, the basket had to be maneuvered through the structure, by moving it in eight feet and up ten feet to the platform level. The opening in the structure was ten feet high, and the width ranged from sixteen feet at the bottom to eight feet at the top.

The weather conditions at the time of the accident were clear with no wind and, a temperature of 60 degrees Fahrenheit.

### Aerial Platform

The self propelled 2004 JLG aerial platform, Model 1350 SJD, weighed 45,120 pounds and was equipped with a Deutz, four cylinder, 87 hp, diesel engine. The controls of the platform contained a switch that allowed the operator to select a weight capacity between 500 and 1,000 pounds. When the switch was set at 500 pounds, the boom would extend a maximum vertical height of 135 feet with a maximum horizontal reach of 80 feet. When the switch was

set at 1000 pounds, the maximum vertical height of the boom was 125 feet and the maximum horizontal reach was 70 feet.

**Main Body and Boom**

The aerial platform consisted of a main body (turntable) mounted on a chassis that rotated 360°. The main boom attached to the main body and rotated with the main body. The boom could be elevated from slightly below the horizontal position until it was almost vertical. The boom had multiple stages which allowed it to be telescoped outward. An eight feet long "jib" boom was attached to the end of the boom.

The jib boom rotated to the left and to the right when the platform capacity switch was set in the 500 pounds capacity position. The total rotation of the jib boom was 180°. The jib boom would not rotate when the capacity switch was set at 1,000 pounds. It moved vertical from 55° below horizontal to 75° above horizontal for a total movement range of 130°. A basket that rotated was attached to the end of the jib boom. A self leveling mechanism was installed to keep the basket level when it was raised or lowered.

**Controls**

The aerial platform had two operator control stations. The main control panel was located in the basket and another control station was located on the machine at ground level. The controls at ground level overrode the basket controls. Both the ground controls and the basket controls could be used to start the machine. The basket control panel also controlled the movements of the aerial platform. The ground control station was located at the right rear of the main body of the machine and also controlled the movement of the basket. The ground controls were used to lower the basket in case of an emergency or if the operator inside the basket was unable to lower the basket. The ground control station did not have controls for driving the machine. The operator stood on the ground beside the machine when using the ground controls.

The speed control dial controlled the maximum speed of most of the boom movements and was found set in the position for the maximum speed. Test showed the speed control reduced the speed of the boom and basket movements but did not control the speed of the basket rotation.

A joystick provided control for driving the aerial platform either forward or backward. When tested, the joystick spring returned to neutral when released and was working properly. The locking ring, which prevented accidental movement of the joystick, was operating

properly. Tests showed the Drive Speed/Torque Select Switch which varies the amount of torque and speed available to for use for driving the aerial platform, was operating properly. The Drive Speed/Torque Select Switch was set for the slowest available drive speed when the accident occurred. The amount of available drive speed used was proportional to the amount of joystick movement.

The steering control on top of the drive joystick inside the basket was operating properly. The steer select switch was operating properly. This switch was found in the four wheel steer position, allowing for the tightest radius by turning both the front and rear wheels in the same direction.

When tested, the axle extend/retract switch operated properly. At the time of the accident, the axles of the machine were extended for better stability.

The foot switch was required to be activated before the controls of the platform could be operated. It was working properly.

A test of the basket/ground select switch indicated it was working properly. When the switch was in the center position, the controls at both control stations were disabled. The engine shut off when this switch was used to switch the control of the machine from one control station to the other. The operator was required to restart the engine before using the machine. The machine shut down as designed.

The power/emergency stop button at each control station worked properly. This control button was required to be pulled out before the machine could be started and operated. When the switch was pushed in, it caused the engine to stop and the controls to be disabled.

The start/auxiliary power switch at both of the control stations would start the engine. The boom and platform function could be operated using the auxiliary pump.

Tests of the joystick on the basket used to control the main boom lift and swing functions showed the joystick worked properly with one exception. The locking ring, which prevented accidental

movement for this joystick, was not functional. The joystick could be moved without lifting the lock ring.

Tests of the boom controls indicated that checking the system slowed the boom movement speeds as the basket neared the edge of the working range. The automatic slow down system was checked at several different locations within the working range and was

operating properly. After the machine was removed from the area where the accident occurred, the boom was placed at the same angle and extended to the same height as it was when the accident occurred. Operation of the boom controls showed the boom movements were operating at a speed that indicated the boom was not within the part of the working range that caused automatic reduction in the boom movement speed. The boom was not operating in the portion of the working range which caused automatic speed reduction. This situation made the use of the speed control dial to reduce the maximum boom movement speed an important factor when the basket was maneuvered in the confined space of the accident location.

The control arc system, which kept the boom extended to the same percentage of the maximum allowable extension when only the boom lift control was used to raise and lower the basket, was checked and found to be working properly. The control arc boom system could cause the boom to telescope into an overhead obstruction if an operator, not properly trained, pushed the boom lift control in the wrong direction and maneuvered the basket under the overhead obstruction. The control arc boom system could also cause the boom to telescope outward into overhead obstructions if the boom lift/swing control was accidentally pushed forward. The investigation revealed the lock ring for preventing accidental movement of the boom lift and swing joystick control was not working. This control could be activated without releasing the lock ring safety device.

Tests indicated that the light and alarm that warned the operator that the boom's lift and telescope functions had been disabled by the automatic control system were operative. Usually the alarm could not be heard above the noise of the plant.

Although the scaffolding side boards being hauled at the time of the accident did not overload the basket, they reduced the space and maneuverability of the operator. In this position, the victim was required to stand close to the control panel. This increased the likelihood that the victim accidentally activated the main boom lift/swing because the lock ring was broken.

## Training

Pierce had worked for Brand for seven days as a laborer, all at Holcim. He had not received training in accordance with 30 CFR, Part 46.

## ROOT CAUSE ANALYSIS

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

**Causal Factor:** A risk assessment to determine possible hazards and to establish safe work procedures was not conducted prior to performing the task of removing the scaffolding from the raw mill building.

**Corrective Action:** Procedures should be established that required a risk assessment be conducted to identify and correct potential hazards and to establish procedures to safely remove the scaffolding from the elevated location.

**Causal Factor:** Management policies, standards, and controls were inadequate. Neither the victim nor his foreman was trained in the health and safety aspects and safe procedures regarding the operating controls of the machine. The speed control dial which controlled the maximum speed of most of the boom movements of the aerial platform was found set for the maximum possible speed.

**Corrective Action:** Management should develop and establish procedures to ensure that equipment operators are task trained to safely operate mobile equipment. Equipment operators should consult the operator's manual for proper procedures prior to performing tasks. Management should monitor employees to ensure that training is adequate.

**Causal Factor:** Procedures were not in place to ensure that the victim's movement was not restricted by material placed in the basket of the aerial platform.

**Corrective Action:** Procedures should be established that prohibit equipment operators from operating aerial platforms from the basket when clearance or freedom of movement within the basket is restricted.

**Causal Factors:** Management policies, standards, and controls were inadequate. Procedures for performing a pre-operational inspection of the machine did not identify that the safety locking ring on the lateral and vertical movement control lever was inoperative. The aerial platform was not removed from service and the defect was not repaired.

**Corrective Action:** Procedures should be established to ensure that pre-operational inspections of mobile equipment are thoroughly conducted. The procedures should address the immediate correction

of any safety defects, including criteria for removing mobile equipment from service.

## CONCLUSION

The accident occurred because Pierce was not trained to safely operate the aerial platform and had no previous work experience operating it. The foreman, who instructed the victim prior to the accident, had not been trained on the safe operation of the machine. The safety locking ring on the joystick control for the main boom lift and swing functions was not functional.

## VIOLATIONS

### Holcim (US) Inc.

Order No. 6113962 was issued on March 23, 2005, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on March 23, 2005, when a contract employee was operating the JLG ULTA Boom 1350 SJP (manlift) serial #0300073368. The employee was attempting to position the machine near the upper level structure, northwest corner of the Raw Mill Building. This order is issued to assure the safety of all persons at this operation. It prohibits all activity of the machine and the area at the northwest corner of the Raw Mill Building, until MSHA has determined that is safe to resume normal operations in this area. The mine operator shall obtain prior approval from an authorized representative for all actions to recover and or restore operations to the affected area.

This order was terminated on April 13, 2005. The conditions that contributed to the accident have been corrected and normal mining operations can resume.

Citation No. 6088157 was issued on May 02, 2005, under the provision of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 46.7(a):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The victim was lowering himself to the ground when the accident occurred. The contractor foreman who instructed

> the victim to operate the equipment was not qualified to train the victim on the safety features of that equipment. The contractor foreman was not qualified or trained himself. The mine operator engaged in aggravated conduct constituting more than ordinary negligence by failing to ensure proper task training was provided.

This citation was terminated on May 2, 2005. The victim, Terry Pierce, was killed when the accident occurred.

Order No. 6088158 was issued on May 2, 2005, under the provision of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 56.9200(f):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The victim was lowering himself to the ground when the accident occurred. Sixteen steel walk boards were found unsecured in the operators cab with the victim. It was common practice to operate the equipment in this manner. The mine operator engaged in aggravated conduct constituting more than ordinary negligence by failing to ensure safe operating procedures of its equipment.

This order was terminated on May 2, 2005. The walk boards were removed from the operator's compartment. Employees were instructed in the safe procedures for transporting materials and personnel together in baskets of aerial platforms.

Order No. 6088164 was issued on June 7, 2005, under the provision of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 56.14100(c):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The victim was lowering himself to the ground when the accident occurred. The locking ring on the control lever that prevented inadvertent lateral and vertical movement was not functional at the time of the accident. The defect had gone uncorrected about one year. The mine operator engaged in aggravated conduct constituting more than ordinary negligence when they failed to remove the equipment from service and repair in a timely manner. This is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on June 30, 2005. Training was provided to mobile equipment operators regarding the correct

procedures for conducting a pre-operational check prior to operating machinery. Training was also provided regarding correct procedures for reporting and correcting defects found during a pre-operational check. The defective part was replaced before the machine was put back into service.

**Brand Scaffold Builders, Inc.**

Citation No. 6088154 was issued on May 2, 2005, under the provision of Section 104(a) of the Mine Act for a violation of 30 CFR 56.9200(f):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The victim was lowering himself to the ground when the accident occurred. Sixteen unsecured steel walk boards had been placed in the operator's compartment, restricting the operators' movement.

This citation was terminated on May 2, 2005. The walk boards were removed from the operator's compartment. Employees were instructed not to transport materials and personnel together in baskets of aerial platforms. Brand has stopped the practice of using aerial platforms to move personnel and material.

Citation No. 6088155 was issued on May 02, 2005, under the provision of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 46.7(b):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The employee was lowering himself to the ground when the accident occurred. The victim had not received appropriate task training on a JLG that he had no prior experience operating. The safety features of this equipment were not explained to him. Foreman Chris Jackson engaged in aggravated conduct constituting more than ordinary negligence by failing to properly train the victim.

This citation was terminated on May 2, 2005. The victim, Terry Pierce, died as a result of the accident. Brand employees were instructed in the safety features of the JLG, and Brand has stopped using aerial platforms to move personnel and material.

Order No. 6088156 was issued on May 02, 2005, under the provision of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 56.14100(a):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The victim was lowering himself to the ground when the accident occurred. The foreman, responsible for placing this equipment into service failed to make a preoperational inspection. Foreman Chris Jackson engaged in aggravated conduct constituting more than ordinary negligence when he failed to conduct a pre-operational inspection and then required another operator to operate the lift without checking for existing defects.

This order was terminated on May 4, 2005. A pre-operational inspection of the machine was performed and a record of the examination was provided to the authorized representative.

Citation No. 6088163 was issued on June 7, 2005, under the provision of Section 104(a) of the Mine Act for a violation of 30 CFR 56.14100(c):

> A fatal accident occurred at this mine on March 23, 2005, when an employee was crushed between the bucket of the JLG aerial platform he was riding in and the metal framework of a building. The victim was lowering himself to the ground when the accident occurred. The locking ring on the control lever that prevented inadvertent lateral and vertical movement was not functional at the time of the accident. The defect had gone uncorrected about one year. The operator, an independent contractor who performed services or construction at the Holcim Holly Hill Mine, had not read the operator's manual for the aerial lift, which would have disclosed the defect.

This citation was terminated on June 30, 2005. Training was provided to mobile equipment operators regarding the correct procedures for conducting a pre-operational check prior to operating machinery. Training was also provided regarding correct procedures for reporting and correcting defects found during a pre-operational check. The defective part was replaced before the machine was put back into service.

Approved by: _____ Date: _____

Michael A. Davis
District Manager

## APPENDIX A

**Persons Participating in the Investigation**

**Brand Scaffold Builders, Inc.**

| | |
|---|---|
| Steve Lacy | branch manager |
| Walter L. Davis | corporate safety manager |
| Chris C. Jackson | foreman/superintendent |
| Marcello Ochoa | laborer |
| Adrian Solis | laborer |

**Industrial Maintenance**

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|---|---|
| Steve J. Potts | owner |

**Briggs Equipment**

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|---|---|
| Eric D. Gill | mechanic road technician |

**Asbell Electric**

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|---|---|
| Jason M. Temple | foreman |

**Holcim (US) Inc.**

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|---|---|
| Andrew T. Bell | maintenance technician |
| Manuel A. Enciso | area coordinator |
| Jeffrey D. Waggoner | instrumentation technician |
| Gary E. Mizzell | maintenance technician |
| Don E. Lawley | maintenance technician |
| Ricky G. Bair | job support services leadman |
| George P. Weathers | operational technician |

**Mine Safety and Health Administration**

| | |
|---|---|
| Wyatt S. Andrews | supervisory mine safety and health inspector |
| Danny W. Wriston | mine safety and health inspector |
| Harold J. Wilkes | mine safety and health inspector |
| Eugene D. Hennen | mechanical engineer |
| Sharon A. Cook | mine safety and health specialist |