MAI-2012-16

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

REPORT OF INVESTIGATION

Underground Nonmetal Mine
Crushed, Broken Limestone NEC

Powered Haulage Accident
October 24, 2012

Martin Marietta Materials Inc.
#273 Weeping Water Mine
Weeping Water, Cass County, Nebraska
Mine I.D. No. 25-00998

Investigators

Mike Tromble
Mine Safety and Health Inspector

F. Terry Marshall
Mechanical Engineer

Thomas Turner
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
Rocky Mountain District
P.O Box 25367, DFC
Denver, Colorado 80225
Richard Laufenberg, District Manager

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OVERVIEW

Darold D. Abbott, Jr., Utility Miner, age 52, was killed on October 24, 2012. Abbott was operating a lift truck, traveling down a decline ramp toward the mine entrance, when he lost control of the vehicle. The lift truck traveled across the haul road, striking a concrete support for a belt conveyor. The lift truck rolled to the right side, landed on its top, and came to rest on its left side. The victim was wearing a seat belt.

The accident occurred due to management's failure to ensure the lift truck was being used as intended by the manufacturer because it was designed to be used on improved surfaces not on rough surfaces as the decline ramp. Additionally, Abbott had not been task trained to operate the lift truck and lost control of the lift truck while traveling down the decline ramp. He was descending an approximate 17% grade while carrying an empty trash dumpster with the load downgrade.

GENERAL INFORMATION

The #273 Weeping Water Mine, an underground limestone operation owned and operated by Martin Marietta Materials Inc., is located near Weeping Water, Cass County, Nebraska. The principal operating officer is Herbert Lewis, Plant Manager. The underground mine normally operates two 11 hour shifts a day, 6 days a week. The surface plant and secondary crushing operation, operates one 12 hour shift a day, 5 days a week. Total employment is 70 persons.

Material is mined using a room and pillar method. The material is drilled and blasted in multiple entries. A front-end loader loads the material into haul trucks that transport it to an underground primary impactor crusher. It is then transported to the surface by belt conveyor. The material is stockpiled for further processing at the surface plant where it is sized, screened, and washed. Finished materials are sold for construction aggregate.

The Mine Safety and Health Administration (MSHA) completed the last regular inspection at this operation on July 26, 2012.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, October 24, 2012, Darold D. Abbott Jr. (victim) started work at 5:30 a.m., his normal starting time. He attended the morning tailgate safety meeting conducted by Ronald Behling, Mine Leadman.

At 5:40 a.m., Abbott and Behling transported the day shift miners underground to change with the night shift miners. Abbott traveled to the underground depot where the trash dumpsters were kept. He conducted a pre-shift inspection on a scaler, identified some operational issues and tagged the machine out of service.

At 8:30 a.m., Marcus Borkowski, Assistant Plant Manager, and Behling met with Abbott underground. Abbott and Borkowski traveled to the surface shop. They met with Jeff Summers, Truck Driver, for Papillion Sanitation, who was to be contracted to remove trash from the dumpsters in the mine.

Summers drove the sanitation company's vehicle and followed Abbott and Borkowski to the underground depot. At 9:15 a.m., Abbott, Borkowski, and Summers met with Behling at the underground depot. They spoke with Summers regarding the size of the dumpster being used and decided a smaller dumpster was needed.

About 9:30 a.m., Abbott rode out of the mine with Summers to get a smaller dumpster to take underground. Abbott conducted a pre-shift inspection on a lift truck with the assistance of Jeff Holman, Contract Mechanic, Nebraska Machinery Company Inc. Defects were found with the machine's CB radio and the brake lights. The necessary repairs were made.

At 10:00 a.m., Behling observed Abbott, behind the surface shop, chaining a dumpster to the lift truck. Abbott drove the lift truck toward the mine entrance and traveled down the left-hand decline ramp with the dumpster facing downgrade.

About 300 feet before the mine entrance, the dumpster fell off the forks of the lift truck and Abbott lost control of the machine. The lift truck traveled diagonally approximately 139 feet across the decline ramp, from left to right, and struck a concrete support for the belt conveyor. The impact shifted the direction of the lift truck to the left, rolling it onto its right side. The machine then traveled on top of the falling object protective structure (FOPS) and came to rest on its left side.

At approximately 10:10 a.m., Behling found the dumpster on the decline ramp and saw the forklift with Abbott pinned under the left side of the FOPS structure. Behling immediately contacted 911. At 10:27 a.m., Emergency Medical Services arrived. At 10:43 a.m., Abbott was pronounced dead by Deputy Karl W. Boehm, Cass County Sheriff's Office. The cause of death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 10:25 a.m., on October 24, 2012, by a telephone call from Herbert Lewis, Plant Manager, to MSHA's National Call Center. Michael Dennehy, Assistant District Manager, was notified and an investigation started the same day. An order was issued under the provisions of Section 103(j) of the Mine Act to ensure the safety of the miners. This order was later modified to a 103(k) of the Mine Act when the first Authorized Representative arrived at the mine.

MSHA's accident investigation team traveled to the mine, conducted a physical inspection of the accident scene, interviewed employees, and reviewed documents and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees, contractor employees, and miners' representatives.

DISCUSSION

Location of the Accident

The accident occurred on a decline ramp that was the left-hand access mine entrance road. Construction of the decline ramp began in 2004 and was completed in 2005. The surface of the decline ramp consisted of crushed limestone. The width of the ramp varied from 30 to 50 feet depending on location.

The decline ramp's average grade was 17% slope toward the mine's underground portals. The ramp was surveyed and the maximum grade was 20.13% with a slope from right to left averaging 0.57%. The ramp was dry at the time of the accident and had been graded earlier that day.

Weather Conditions

The weather conditions at the time of the accident were overcast with fog, a temperature of 55 degrees Fahrenheit, and 90% relative humidity. Weather was not considered to be a factor in the accident.

Papillion Sanitation

Papillion Sanitation, a trash disposal company, was contracted by the mine operator to pick up trash at the mine. From interviews with miners, the investigators learned that they raised concerns regarding the practice of using a lift truck to haul the dumpsters in and out of the decline ramp. On the day of the accident, a representative of Papillion Sanitation was making the initial pick up of trash from inside the mine. The trash dumpster in the mine was not compatible with the trash truck and it was determined that a smaller dumpster, located on the surface, would be compatible and should be brought into the mine. This dumpster was the one the victim was hauling down the decline ramp when the accident occurred.

After the accident occurred, the mine operator decided not to have Papillion Sanitation travel into the mine to pick up the trash. The mine operator purchased a lift truck, capable of operating on the decline ramp within the design of the manufacturer, to pick up the trash inside the mine.

Lift Truck

1) MACHINE INFORMATION: The straight mast type high lift fork truck involved in the accident was a Caterpillar Model DP40 lift truck, with a Model 3M40A47 mast. It had front-wheel drive with rear steering and single type drive wheels (non-duals) on the drive (front) axle. The lift truck was equipped with a Mitsubishi S6E diesel engine with a rated output of 69 HP at 2,450 RPM and a single speed "powershift" automatic transmission [(1)]. The transmission control positions included forward, neutral, and reverse directions.

Product information indicated the lift truck had a wheelbase of approximately 79 inches, an overall width of approximately 56 inches, an overall length to the fork face of 121 ½ inches, a height to the top of the overhead guard of approximately 89 inches, and a top forward speed of approximately 12 ½ miles per hour [(1)]. The product plate on the machine indicated an empty truck weight of approximately 13,120 pounds and a maximum load capacity of 6,800 pounds.

The lift truck had three foot pedal controls oriented in a typical automotive type arrangement used for a manual transmission type vehicle. The three foot pedals included, in a right to left orientation; an accelerator pedal, a service brake pedal and an inching pedal. The inching pedal provided a modulated combination of transmission disengagement and service brake application as this pedal was pushed downward. The operator's manual indicated using the inching pedal allowed the driver to move the machine slowly while maintaining the engine speed. Complete application of the inching pedal put the transmission in neutral and applied the service brakes [(2)].

The lift truck had hydraulic applied service brakes on each side of the drive axle (front axle) that were controlled by foot pedals and hydraulic assisted steering on the steering axle (rear axle) controlled by a steering wheel. It had mechanical actuated parking brakes controlled by a hand lever on the left side of the dash panel. The directional (transmission) control used a hand lever control arrangement on the left side of the steering column, below the steering wheel, with the forward position for forward, the center position for neutral and the rear position for reverse.

2) GENERAL CONDITION OF THE LIFT TRUCK: The lift truck overturned and came to rest on its left side. A debris field was observed within the roadway area starting in the area of the concrete support and continuing to the area immediately down slope of the final location of the machine.

The lift truck sustained damage to the transmission bell housing, the engine cover, and the FOPS. When the accident occurred, the rear portion of the seat frame pulled away from the engine cover and the engine cover latch failed, allowing the operator's seat to move relative to the lift truck's frame within the operator's compartment area. The floor pan also separated from the lift truck and damaged the accelerator pedal but the service brake and inching foot pedal assemblies were undamaged.

All of the brake system's hydraulic, vacuum, axle, and wheel end components were visibly intact. The brake lines for the hydraulic service brake system were not damaged. The batteries were dislodged from their mounting brackets and the battery cables were cut during recovery activities.

The engine was started to conduct limited functional tests on the lift truck after the battery cables were repaired, the batteries replaced, and the hydraulic oil and engine fluid levels were topped off. The fuel level within the tank was observed to be at least half full and was not topped off prior to conducting the limited functional tests referenced above.

Although the engine could be started and operated, investigators determined the machine could not be driven for testing purposes without significant repairs. Any

tests mentioned hereafter were performed with the lift truck stationary and before any repairs were made.

3) SERVICE BRAKE SYSTEM DESIGN: The lift truck was equipped with a hydraulic applied, vacuum assist, single circuit service brake system that used 12 ½ inch x 2 ½ inch (nominal drum diameter x nominal shoe width) drum brakes on each of the two drive wheels. The hydraulic applied service brakes were controlled using either the foot brake pedal or the inching pedal. The vacuum booster used a belt driven vacuum pump. The engine used a single drive belt to drive all of the engine accessories, including the brake booster's vacuum pump.

4) PARKING BRAKE SYSTEM DESIGN: The lift truck was equipped with mechanically applied parking brakes controlled by a hand lever on the left side of the dash panel. The parking brake system used the same drum brake wheel end components as the service brakes except the drum brakes on each of the two drive wheels (front axle) were mechanically expanded to force the shoes out to the drum when the parking brake lever was applied. Two cables, one for each wheel end on the front axle, were used to transmit mechanical force between the parking brake control lever and the wheel ends.

5) STEERING SYSTEM DESIGN: The lift truck had a hydraulic assisted mechanical linkage type steering arrangement that used a steering wheel to control steering of the rear axle. The steering wheel used mechanical linkages to steer the rear wheels. In addition to the mechanical linkage arrangement, a steering valve connected to the steering shaft operated a single two-way steering cylinder to provide power assist. The steering system used the same engine driven hydraulic pump to provide hydraulic pressure and flow to both the fork hydraulics and the steering valve. With a rear steer steering system, the rear tires turned in the opposite direction of the desired turn (rear tires turned left to steer the lift truck to the right and vice versa).

6) SERVICE BRAKE TESTING AND EXAMINATIONS: All of the service brake system's hydraulic, vacuum, axle, and wheel end components were visibly intact including the belt for the engine driven vacuum pump. The hydraulic brake lines and master cylinder for the single circuit hydraulic service brakes were physically undamaged, the brake fluid within the master cylinder reservoir was near the maximum fluid level mark of the reservoir, and no visible hydraulic leaks were observed when the brakes were applied.

Field tests indicated the service brakes were capable of holding the empty lift truck stationary on a minimum grade of approximately 32 percent and were able to maintain this holding performance for at least five minutes when the brake pedal applied and held.

The wheel and drums were removed from the front axle and the wheel end brake components were visually examined. All of the brake hardware was visibly intact

and functioned when the brakes were hydraulically cycled. All four of the shoe linings were measured to be approximately 0.22 inches thick, within the service manual's repair limit specifications of a minimum thickness of 0.12 inches [(3)]. The shoe linings and drums of either brake did not exhibit signs of any significant overheating.

7) PARKING BRAKE TESTING: All of the parking brake system's components were visibly intact and functioned when the brakes were mechanically cycled. Field tests indicated the parking brakes were capable of holding the empty lift truck stationary on a maximum grade of approximately 22 percent.

8) STEERING SYSTEM TESTING: The steering system was functionally tested with the engine running at idle with the steer tires on a dirt covered concrete surface. The steering cylinder and linkages modulated with steering wheel motion, going from full lock to full lock in both left and right steering directions, with no sticking or binding. Visual observations of the linkage connections, while cycling the steering, did not detect any significant wear in steering linkage or pin connections.

The drive shaft for the engine driven hydraulic pump for the fork attachment and steering system was visibly intact.

9) TRANSMISSION CONTROL TESTING: The transmission control was tested with the engine running. Transmission engagement and disengagement corresponded with the control position and it moved throughout its range and between each of the three detent positions (i.e., forward, neutral, and reverse) without sticking or binding.

10) ENGINE ACCELERATOR CONTROL TESTING: The accelerator pedal was damaged during the accident. The engine throttle control linkage was tested with the engine running but without the pedal attached. The linkage moved throughout its range without sticking or binding, engine RPM corresponded with linkage movement, and the engine returned to low idle when the linkage spring returned after being released from a modulated position.

11) LIFT TRUCK TIRES: The lift truck had foam-filled, size 8.25-15 single tires on the front axle (drive axle) and foam-filled, size 7.00-12 single tires on the rear axle (steering axle). The parts manual indicated available tire options included[(4)]:

- size 8.25-15, pneumatic or non-pneumatic type tires on the front axle; single or duals
- size 7.00-12, pneumatic or non-pneumatic type tires on the rear axle; single only

12) SEAT BELT ASSEMBLY: The seat assembly had a retractable lap type seat belt with a webbing width of approximately two inches. The seat belt latched and unlatched when tested.

13) LIFT TRUCK LOAD: The lift truck was carrying an empty trash dumpster at the time of the accident. During the investigation, the trash dumpster was weighed using the mine's truck scale. The truck scale indicated the empty trash dumpster weighed 580 pounds, approximately 8½ percent of the lift truck's maximum load capacity of 6,800 pounds.

REFERENCES:

(1) Caterpillar CECB1058, October 1992, 8,000-11,000 lb. Capacity Gas and Diesel Pneumatic Tire Lift Trucks.

(2) Caterpillar SEBU6658, October 1992, DP40 Operation & Maintenance Manual, page 3.

(3) Caterpillar SENB8542, November 1992, DP40 Service Manual, page 168.

(4) Caterpillar SEBN2696-01, Copyright 1993, DP40 Parts Manual, pages 256-266.

Training and Experience

Darold D. Abbott Jr., victim, had 19 years of experience all at this mine. A representative of MSHA's Educational Field Services staff conducted an in-depth review of the mine operator's training records. Abbott had not received task training to operate the lift truck on the decline ramp.

ROOT CAUSE ANALYSIS

Investigators conducted a root cause analysis to identify the underlying causes of the accident. They identified the following root causes and the corresponding corrective actions implemented to prevent a recurrence of the accident.

ROOT CAUSE: Management policies and procedures failed to ensure the lift truck was being used as intended by the manufacturer because it was designed to be used on improved surfaces not on rough surfaces as the decline ramp. *The manufacturer's operator manual for this lift truck states "The lift trucks are NOT intended for use on public roads. The cushion tire lift trucks are designed for use indoors on smooth dry surfaces" and "DO avoid slippery surfaces!"*

CORRECTIVE ACTION: The mine operator evaluated the conditions and safety practices to identify equipment that is designed to operate on the grades subjected to on the decline ramp. The mine operator purchased a lift truck, capable of operating on the decline ramp within the design of the manufacturer, to pick up the trash inside the mine. Additionally, warning signs were posted at the approaches of the decline ramp.

ROOT CAUSE: The victim had not been task trained to operate the lift truck. He was descending an approximate 17% grade while carrying an empty trash dumpster with the load downgrade.

CORRECTIVE ACTION: All persons assigned to operate the new lift truck on the decline ramp were task trained to operate the vehicle and trained to look for the warning signs posted at the approaches of the decline ramp.

CONCLUSION

The accident occurred due to management's failure to ensure the lift truck was being used as intended by the manufacturer because it was designed to be used on improved surfaces not on rough surfaces as the decline ramp. Additionally, Abbott had not been task trained to operate the lift truck and lost control of the loader while traveling down the decline ramp. He was descending an approximate 17% grade while carrying an empty trash dumpster with the load downgrade.

ENFORCEMENT ACTIONS

Issued to Martin Marietta Materials Inc.

Order No. 8595127 -- issued under the provisions of Section 103(j) of the Mine Act:

> *An accident occurred at this operation on October 24, 2012, at approximately 10:10 a. m. This order is being issued under Section 103(j) of the Mine Act of 1977 to ensure the safety of all persons at this operation. This order is also issued to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident. It prohibits all activity at the south mine entrance portal and extends to the top of the south entrance decline ramp, until MSHA has determined that it is safe to resume normal mining operations in this area. This order was initially issued orally to the mine operator at 11:10 a.m., on October 24, 2012.*

The order was subsequently modified to Section 103(k) on October 24, 2012, after an Authorized Representative arrived at the mine. This order was terminated on November 26, 2012, after conditions and practices that contributed to the accident no longer existed.

Citation No. 8593328 -- issued under the provisions of 104(d) of the Mine Act for a violation of 30 CFR Part 57.9101:

> *A fatal accident occurred on October 24, 2012, at this operation when the operator of the Caterpillar DP40 lift truck lost control and struck a concrete belt conveyor support, causing the lift truck to overturn. The operator was descending a ramp with an approximate 17% grade while carrying an empty trash dumpster with the load downgrade. The operator of the self-propelled mobile equipment failed to maintain control of the equipment while it was in motion. Mine management engaged in aggravated conduct constituting more than ordinary negligence by failing to establish and implement policies and procedures for operators to maintain control of equipment while traveling this ramp. This violation is an unwarrantable failure to comply with a mandatory standard.*

Order No. 8593329 -- issued under the provisions of 104(d) of the Mine Act for a violation of 30 CFR Part 57.16016(b):

> *A fatal accident occurred on October 24, 2012, at this operation when the operator of the Caterpillar DP40 lift truck lost control and struck a concrete belt conveyor support, causing the lift truck to overturn. The operator was descending a ramp with an approximate 17% grade while carrying an empty trash dumpster with the load downgrade. Mine management engaged in aggravated conduct constituting more than ordinary negligence by failing to require the load be placed in an upgrade position when descending a grade in excess of 10 percent. This violation is an unwarrantable failure to comply with a mandatory standard.*

Order No. 8593330 -- issued under the provisions of 104(d) of the Mine Act for a violation of 30 CFR Part 57.14205:

> *A fatal accident occurred on October 24, 2012, at this operation when the operator of the Caterpillar DP40 lift truck lost control and struck a concrete belt conveyor support, causing the lift truck to overturn. This lift truck was being operated on a crushed limestone ramp that had an average 17% grade. The manufacturer's operator manual for this lift truck states "The lift trucks are NOT intended for use on public roads. The cushion tire lift trucks are designed for use indoors on smooth dry surfaces" and "DO avoid slippery surfaces! Sand, gravel, ice or mud and cause a tipover. If unavoidable, slow down". Mine management engaged in aggravated conduct constituting more than ordinary negligence by failing to establish and implement policies and procedures regarding operating lift trucks as recommended by the manufacturer. This violation is an unwarrantable failure to comply with a mandatory standard.*

Order No. 8593331 -- issued under the provisions of 104(d) of the Mine Act for a violation of 30 CFR Part 48.7:

> *Darold D. Abbott., a utility miner and the victim of the fatal accident that occurred on October 24, 2012, had not received the MSHA-required task training operating the Caterpillar DP40 lift truck on the decline for the mine. The mine operator was aware of the Part 48 training requirements. The Federal Mine Safety and Health Act of 1977 states that an untrained miner is a hazard to himself and to others. Management engaged in aggravated conduct constituting more than ordinary negligence in that they were aware of the training requirements and directed Abbott to operate the lift truck on the decline, yet failed to provide the required training prior to Abbott's assuming those duties. This violation is an unwarrantable failure to comply with a mandatory standard.*

Approved By: Date: March 5, 2013

Richard Laufenberg
District Manager

List of Appendices

Appendix A

Persons Participating in the Investigation

Martin Marietta Materials Inc.

Herbert Lewis…….Plant Manager
Todd Clock……..V. P. /General Manager
Brian White……..V. P. / H.R. and Safety
Mark Worrall……H.R. and Safety Manager
Malinda Feola……H.R Director
Marcus Borkowski……..Assistant Plant Manager
Adam Lewis……Assistant Plant Manager
Karen Johnston……..Legal Counsel (Jackson & Kelly)
Guy Barbera……..Jacobson Forensic

Nebraska Machinery Company Inc.

Craig Irish……Lift Truck Service Manager
Mike Ostrand……Field Service Technician

Operating Engineers Local 571

Robert Jordon……..Miners' Representative
John Furgerson…… Miners' Representative
Bob Vodicka……Miners' Representative

Mine Safety and Health Administration

Mike Tromble……Mine Safety and Health Inspector
Thomas Turner……Mine Safety and Health Specialist
F. Terry Marshall……Mechanical Engineer

Appendix B

Victim Data Information

Accident Investigation Data - Victim Information

Event Number: 6 6 1 5 4 0 3

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

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Degree of Injury:
Darold D. Abbott Jr.	*M*	*52*	*01 Fatal*

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:	6. Date and Time Started:
a. Date: 10/24/2012 b.Time: 10:43	*a. Date: 10/24/2012 b.Time: 5:30*

7. Regular Job Title:	8. Work Activity when Injured:	9. Was this work activity part of regular job?
016 Utility Miner	*052 Forklift Operator*	Yes X No

10. Experience	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	*1*	*0*	*2*	b. Regular Job Title:	*1*	*0*	*2*	c: This Mine:	*19*	*0*	*5*	d. Total Mining:	*19*	*0*	*5*

11. What Directly Inflicted Injury or Illness?	12. Nature of Injury or Illness:
105 Forklift	*170 Crushing, Blunt Trauma*

13. Training Deficiencies:

Hazard:		New/Newly-Employed Experienced Miner:		Annual:		Task:	X

14. Company of Employment: (If different from production operator)
Operator

Independent Contractor ID: (if applicable)

15. On-site Emergency Medical Treatment:

Not Applicable:		First-Aid:		CPR:		EMT:	X	Medical Professional:	X	None:	

16. Part 50 Document Control Number: (form 7000-1)

17. Union Affiliation of Victim: *2501 Int Union Operating Engineers*