

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

REPORT OF INVESTIGATION

Surface Nonmetal Mine  
(Sand and Gravel)

Fatal Machinery Accident  
April 17, 2014

Hafenstine Plant #1  
Hafenstine Construction Company  
Alma, Wabaunsee County, Kansas  
ID No. 14-01708

Investigators

Lee A. Hughes  
Mine Safety and Health Inspector

F. Terry Marshall  
Mechanical Engineer

Thomas Turner  
Mine Safety and Health Specialist (Training)

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

Harold Steege, Truck Driver, age 58, was killed at this operation on April 17, 2014. Steege was standing outside the cab of a dump truck that he had just parked at the pit. He was waiting for an excavator to load the truck with material. Steege was struck by the excavator bucket and crushed between the excavator bucket and the truck.

The accident occurred due to management's failure to establish safe work procedures for truck drivers waiting to be loaded in the pit. Steege left the protection of his truck's cab and was crushed when the loading process began.

## GENERAL INFORMATION

Hafenstine Plant #1, a sand and gravel operation owned and operated by Hafenstine Construction Company, is located in Alma, Wabaunsee County, Kansas. The principal official is Donald P. Hafenstine, Owner/Operator. The mine usually operates one 8 hour shift a day, 5 days a week. Total employment is 6 persons.

Material is mined from multiple areas along Mill Creek. The material is excavated from the bottom of the creek bed using an excavator. The excavator loads the material into dump trucks which transport the material to the plant located approximately 3 miles away from the pit. The material is then screened, processed, and sold for construction aggregate.

The Mine Safety and Health Administration (MSHA) completed the last regular inspection at this operation on February 28, 2014.

## DESCRIPTION OF ACCIDENT

On the day of the accident, Harold Steege (victim) arrived at the mine about 8:00 a.m. Steege and Tyler Wegele, Equipment Operator, were assigned to the screening plant to screen creek gravel.

At approximately 11:00 a.m., Brian Hafenstine, Supervisor, reassigned Steege and Wegele to the south branch of Mill Creek. Steege was to haul material from the creek to the plant and Wegele was to load trucks with the excavator.

At approximately 3:30 p.m., Steege arrived in his truck for a load of material and positioned the truck to be loaded. Wegele trammed the excavator behind Steege's truck. Wegele saw Steege exit the truck while he moved the excavator into position to load it. Wegele positioned the excavator at the back of the truck and started to load it. However, he inadvertently swung the excavator bucket to the right, pinning Steege between the excavator bucket and the truck bed. Wegele immediately swung the bucket to the left and exited the cab to assist Steege. Wegele called 911 for assistance and the Alma Emergency Medical Service, Fire, and Sheriff Departments were dispatched to the accident at 3:35 p.m.

Steege was pronounced dead at 4:45 p.m., by Dr. Diana K. Katt, M.D., Wabaunsee County Coroner. The cause of death was attributed to blunt force trauma.

## INVESTIGATION OF ACCIDENT

Janet Hafenstine, wife of the owner, called Sidney Garay, Field Office Supervisor, Topeka, Kansas, at 4:02 p.m., on April 17, 2014, to notify MSHA of the accident. Garay advised her to call MSHA's National Call Center. Garay then notified Richard Laufenberg, District Manager, and Dustan Crelly, Assistant District Manager, 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 Section 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 the mine management, employees, and local law enforcement.

## DISCUSSION

### Location of the Accident

The accident took place at the south branch location of Mill Creek. The load out area was relatively flat and dry. The plant is located approximately 3 miles from this area.

### Weather Conditions

The weather conditions on the day of the accident were clear skies with a slight breeze and a temperature of 51 degrees Fahrenheit.

### Physical Factors

1) MACHINE INFORMATION: The track-mounted excavator involved in the accident was a 1994 Caterpillar Model 320L with an 18 foot, 7 inch R type boom, a 9 foot, 7 inch R2.9B type stick, and a 1.25 cubic yard trenching bucket. Product information indicated it was equipped with a Caterpillar 3066 diesel engine with a rated output of 128 HP at 1,800 RPM. The machine had a two speed hydrostatic drive for ground travel with each track driven by an independent hydraulic motor. The excavator had a ground level reach of approximately 34 feet, 11 inches and an operating weight of approximately 45,000 pounds.



2) GENERAL CONDITION OF THE EXCAVATOR: The excavator did not incur any damage during the accident. The machine was in operational condition to conduct functional tests during the field investigation.

3) IMPLEMENT AND SWING SYSTEM DESIGN: The implement and swing systems used two pilot-operated joystick hand levers oriented in a standard backhoe loader pattern to control the boom, stick, bucket and upper structure swing features (see Photo No. 1, Photo No. 2 and Figure No. 1). Oblique movement of either joystick hand lever correspondingly operated two functions simultaneously.

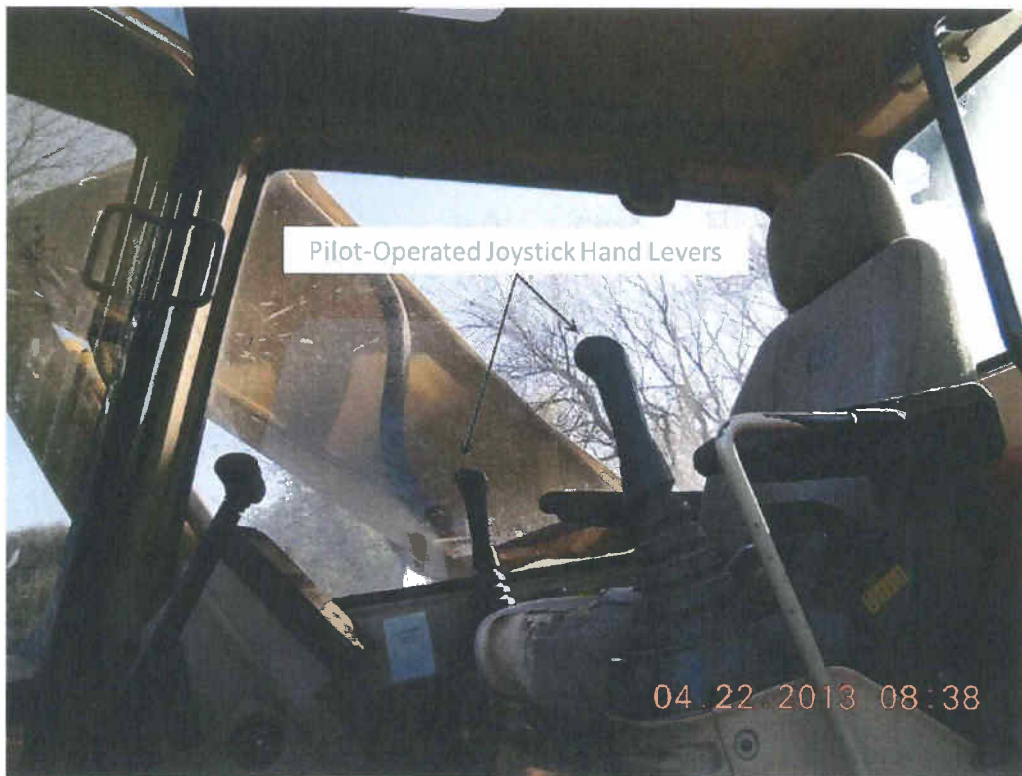


Photo No. 1: Oblique View of Operator's Cab Showing Layout of Implement and Swing Hand Controls

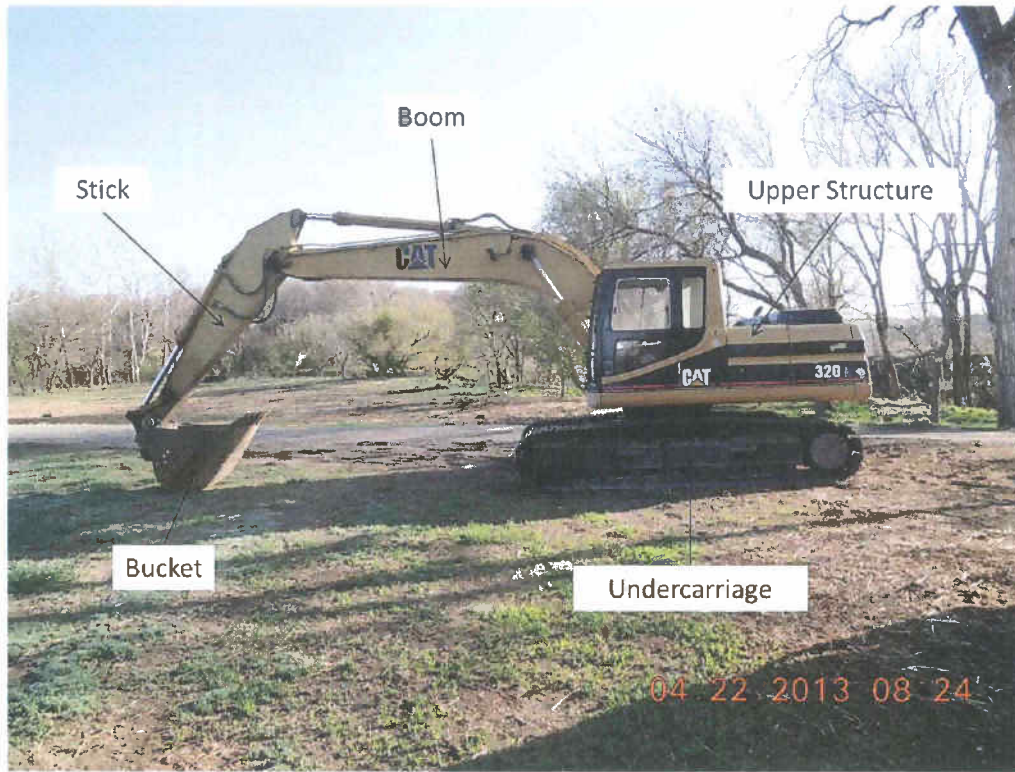


Photo No. 2: Identification of General Excavator Components

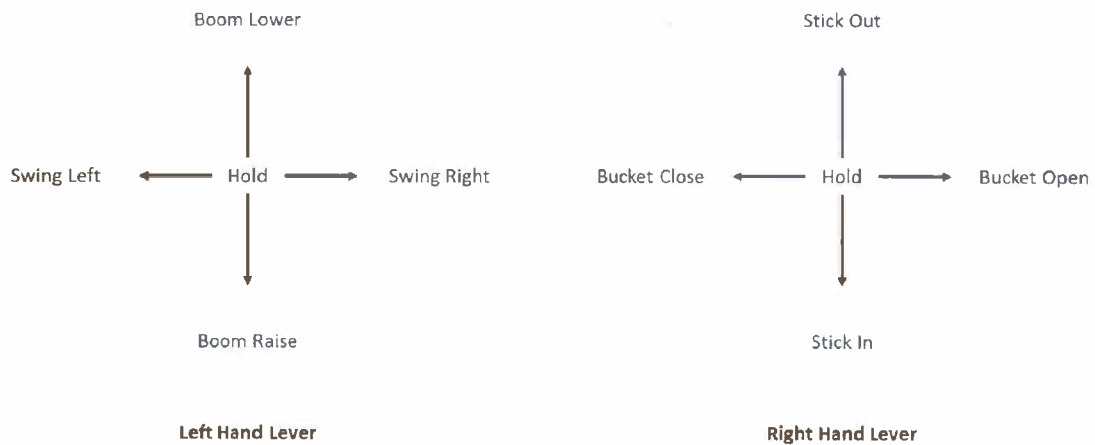


Figure No. 1: Patterns of Implement and Swing Hand Control Levers (Standard Backhoe Loader System Patterns)

The pilot-operated hand levers delivered hydraulic signal pressures to the main hydraulic valve system to provide actuation of each of the implement and swing systems (i.e., they were hydraulic over hydraulic systems). The boom, stick and bucket systems used two-way hydraulic cylinders for actuation while the upper



structure system used a hydraulic motor, or swing motor, to provide left and right rotation relative to the undercarriage.

The hydraulic pilot system included a nitrogen-filled gas type accumulator to provide oil to the pilot circuit as makeup oil during combined operations and for lowering implements immediately after the engine has been stopped.

4) SWING BRAKE SYSTEM DESIGN: The swing motor had a spring-applied, hydraulic release type swing brake integral to the hydraulic swing motor housing. Pilot pressure from the hand lever controls was used to release and apply this spring brake. Release pressure was supplied to the swing brake when any of the implements or the swing motor was actuated with the hand lever controls to cause boom, stick, bucket and upper structure swing movements. Hydrostatic braking of the swing motor occurred after both of the two hand lever controls were moved to the hold positions and then the swing brake applied after the swing motor stopped rotating.

5) IMPLEMENT SYSTEMS, SWING SYSTEM AND SWING BRAKE TESTS: The implement and swing hand lever controls operated without any observed sticking or binding and returned to center (the hold positions) when released. Swing motor pilot pressures were observed to modulate proportionally with the amount of control movement throughout the swing control ranges. No erroneous swing motor pilot pressures were observed during operation of the boom, stick, and bucket. Swing brake release pressures were observed during operation of all three implements and the swing motor. Release pressure was quickly applied when any of the three implements or the swing motor was actuated. Observations of the swing brake release pressures indicated the delayed application feature also functioned in that the brake applied only when both hand controls were moved to the hold positions and after the swing motor stopped rotating.

Swing brake static drift tests were conducted with the machine on an approximate 20 percent grade, a loaded bucket, the boom and stick implements at full reach, and an upper structure position 90 degrees to the direction of the decline as specified by Caterpillar. No movement or creep of the upper structure was observed with the implement and swing hand lever controls in the hold positions during these tests.

Hydrostatic braking of the swing motor, or over swing, was tested and was within Caterpillar specifications.

The investigators performed swing brake static drift tests to determine if under extreme specific operating conditions, unintended swing movement of the upper structure could occur. This condition would be caused by a large side force on

the boom, stick or bucket, the upper structure swing system that could allow limited rotation in the direction of the applied moment whenever the boom, stick, or bucket hand lever controls were first actuated (i.e., when the swing brake is first released). When tested, the resulting bucket movement at maximum reach was approximately 14 inches when any of the implement controls were first actuated. Based on the physical characteristics of the excavator, the resulting bucket movement at minimum reach under these specific operating conditions was estimated to be approximately 4½ inches.

This movement was due to swing motor pressures needing to build up to a level that overcomes the applied moment after the swing brake is initially released. However, the specific operating conditions as determined by the investigators by observing the physical characteristics at the accident site did not support that this type of movement occurred; or if a relatively small amount of movement did occur, that it contributed to the accident.

At the time of the accident, investigators determined that no apparent external loads were on the upper structure to cause the bucket to move toward the truck. There appeared to be only a slight side slope in the accident area that could cause a relatively small left swing (counterclockwise) moment and the excavator bucket swung in the right swing (clockwise) direction when the accident occurred.

Tests also determined the pilot system accumulator was defective. The accumulator did not have any nitrogen pre-charge in it. This defect causes slower machine responses during combined operations and does not allow lowering of the implements immediately after the engine has been stopped. A non-contributory citation was issued.

### Summary

No defects were identified with the swing system that contributed to the accident:

- The swing and implement hand lever controls operated without any observed sticking or binding and returned to the hold positions when released.
- The delayed application feature of the swing brake functioned in that the swing brake applied only when both hand lever controls were moved to the hold positions and after the swing motor stopped rotating. This was consistent with its design. The static drift of the swing brake was tested and was within Caterpillar specifications. No movement or creep of the upper structure could have occurred in the accident area with the implement control levers in the hold positions and the swing brake fully

- applied.
- Swing motor pilot pressures were observed to modulate proportionally with the amount of control movement throughout the swing control ranges and no erroneous swing motor pilot pressures were observed during operation of the three implements to include the boom, stick and bucket.
  - Hydrostatic braking of the swing motor, or over swing, was tested and was within Caterpillar specifications.
  - The pilot system accumulator was defective in that it did not have any nitrogen pre-charge in it. This causes slower machine responses during combined operations and does not allow lowering of the implements immediately after the engine has been stopped.

### Training and Experience

Harold Steege (victim) had 3 years, 24 weeks and 6 days of mining experience, all at this mine. A representative of MSHA's Educational Field Services reviewed the mine operator's training records and found Steege had not received training in accordance with Part 46.7(a).

### **ROOT CAUSE ANALYSIS**

A root cause analysis was conducted to identify the underlying cause of the accident. Listed below are root causes identified during the analysis and the corresponding corrective actions implemented to prevent a recurrence of the accident.

Root Cause: Management failed to implement a policy to ensure that truck drivers remained in their trucks while being loaded, and failed to task train truck drivers on safe load out operation procedures.

Corrective Action: Management established procedures for truck drivers to follow, including remaining in their trucks, during load out operations. All truck drivers were trained regarding these procedures.

Root Cause: Management failed to establish procedures to ensure that excavator operators would not begin any loading activity if a truck driver left the protection of the cab of the truck, and failed to task train task excavator operators on safe load out operation procedures.

Corrective Action: Management established procedures to ensure that excavator operators would not load any trucks if the truck driver left the protection of the cab of the truck. All excavator operators were trained regarding these procedures.

## CONCLUSION

The accident occurred due to management's failure to establish safe work procedures for truck drivers waiting to be loaded in the pit. Steege left the protection of his truck's cab and was crushed when the loading process began.

## ENFORCEMENT ACTIONS

**Order No. 8595397**- issued under the provisions of Section 103(j) of the Mine Act:

*An accident occurred at this operation on April 17, 2014 at approximately 3:45 p.m. This order is being issued, under Section 103(j) of the Federal Mine Safety and Health Act of 1977, to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident. It prohibits all activity at South Branch Mill Creek extraction site 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 4:02 p.m., and has now been reduced to writing.*

The order was subsequently modified to Section 103(k) after an Authorized Representative arrived at the mine. This order was terminated on May 13, 2014, after conditions that contributed to the accident no longer existed.

**Citation No. 8761864** - issued under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 56.9101:

*A fatal accident occurred on April 17, 2014, at this operation when the operator of the Caterpillar 320L excavator failed to maintain control of the rotation swing and struck and killed a truck driver that had exited the truck that he was driving. The victim had returned from hauling a load of material to a stockpile at the operator's screening operation, approximately 3 miles away, and had positioned the truck next to the load out pile and exited the cab of his truck. The Excavator Operator had loaded another truck out of another pile of material and was tramming back to load the victim's truck when he swung the excavator bucket into the victim.*

This order was terminated on May 19, 2014, after the equipment operator, for the Caterpillar 320L excavator, had received task training including JSA training, on the safe operation of the equipment.

**Citation No. 8761865** - issued under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 46.7(a):

*Harold Steege, a Truck Driver and the victim of the fatal accident that occurred on April 17, 2014, had not received complete MSHA-required task training, including the safe work procedures of staying in the equipment while in the active load out area. The mine operator was aware of the Part 46 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 Steege to operate the truck, yet failed to provide the required training prior to Steege's assuming those duties. This violation is an unwarrantable failure to comply with a mandatory standard.*

This citation was terminated on May 16, 2014. The basis for termination of this citation is the death of the miner that did not receive adequate task training.

**Citation No. 8761866** - issued under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 46.7(a):

*Harold Steege, a Truck Driver and the victim of the fatal accident that occurred on April 17, 2014, when he was struck by the bucket of the CAT 320L excavator when the excavator operator was moving the machine into position to load Steege's truck. The mine operator had not provided adequate MSHA-required task training, including the safe work procedures of equipment while in the active load out area. The excavator operator did not stop the machine when he became aware that Steege was out of his truck and was not in sight. The mine operator was aware of the Part 46 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 miners to load out material without giving them the adequate training.*

This citation was terminated on May 19, 2014, after the equipment operator of the Caterpillar 320L excavator had received task training on the safe load out procedure.

Approved By:

Date: July 2, 2014



Richard Laufenberg  
District Manager



## **LIST OF APPENDICES**

Appendix A-Persons Participating in the Investigation

Appendix B-Victim Data Information

## Appendix A

### Persons Participating in the Investigation

#### Hafenstine Construction Company

Donald Hafenstine	Owner/Operator
Brian Hafenstine	Supervisor
Tyler Wegele	Equipment Operator
John Yonk	Miner

#### Mine Safety and Health Administration

Lee A. Hughes	Mine Safety and Health Inspector
Thomas Turner	Mine Safety and Health Specialist (Training)
F. Terry Marshall	Mechanical Engineer

## Appendix B

**Accident Investigation Data - Victim Information**

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



Event Number: **6 6 1 8 5 8 3**

<b>Victim Information:</b> 1																	
1. Name of Injured/Ill Employee <i>Harold G. Steege</i>				2. Sex <i>M</i>		3. Victim's Age <i>58</i>		4. Degree of Injury <i>01 Fatal</i>									
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 04/17/2014 b. Time: 16:45</i>								6. Date and Time Started: <i>a. Date: 04/17/2014 b. Time: 15:40</i>									
7. Regular Job Title <i>176 Truck driver</i>				8. Work Activity when Injured: <i>055 Operating dump truck</i>				9. Was this work activity part of regular job? <table style="width: 100%;"><tr><td>Yes</td><td><input checked="" type="checkbox"/></td><td>No</td></tr></table>						Yes	<input checked="" type="checkbox"/>	No	
Yes	<input checked="" type="checkbox"/>	No															
10. Experience <i>a. This</i>			Years	Weeks	Days	<i>b. Regular</i>			Years	Weeks	Days	<i>c. This</i>			<i>d. Total</i>		
Work Activity:			3	24	6	Job Title:			3	24	6	Mining			3	24	6
11. What Directly Inflicted Injury or Illness? <i>076 Caterpillar 320L Excavator</i>								12. Nature of injury or illness <i>170 Crushed between bucket and truck</i>									
13. Training Deficiencies: Hazard: <i>New/Newly-Employed Experienced Miner</i> Annual:      Task: <input checked="" type="checkbox"/>																	
14. Company of Employment (if different from production operator) <i>Operator</i>										Independent Contractor ID (if applicable)							
15. On-site Emergency Medical Treatment: Not Applicable:      First-Aid:      CPR:      EMT:      Medical Professional:      None: <input checked="" type="checkbox"/>																	
16. Part 50 Document Control Number (form 7000-1)								17. Union Affiliation of Victim: <i>9999</i> None (No Union Affiliation)									