CAI-2009-03

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Surface Mine Facility

Fall Accident
February 26, 2009

Evansville Garage Door Company, ID W824
Evansville, Indiana

at

Minuteman Fines Recovery Plant
Covol Fuels No 2 LLC
Greenville, Muhlenberg County, KY
ID No. 15-19205

Accident Investigators

William Barnwell
Mine Safety and Health Coal Mine Inspector
Eugene Hennen & Dean Nichols
Mechanical and Engineering Safety Division, Approval and Certification Center

Originating Office
Mine Safety and Health Administration
District 10
100 YMCA Drive
Madisonville, KY, 42431-9010
Carl E. Boone II, District Manager

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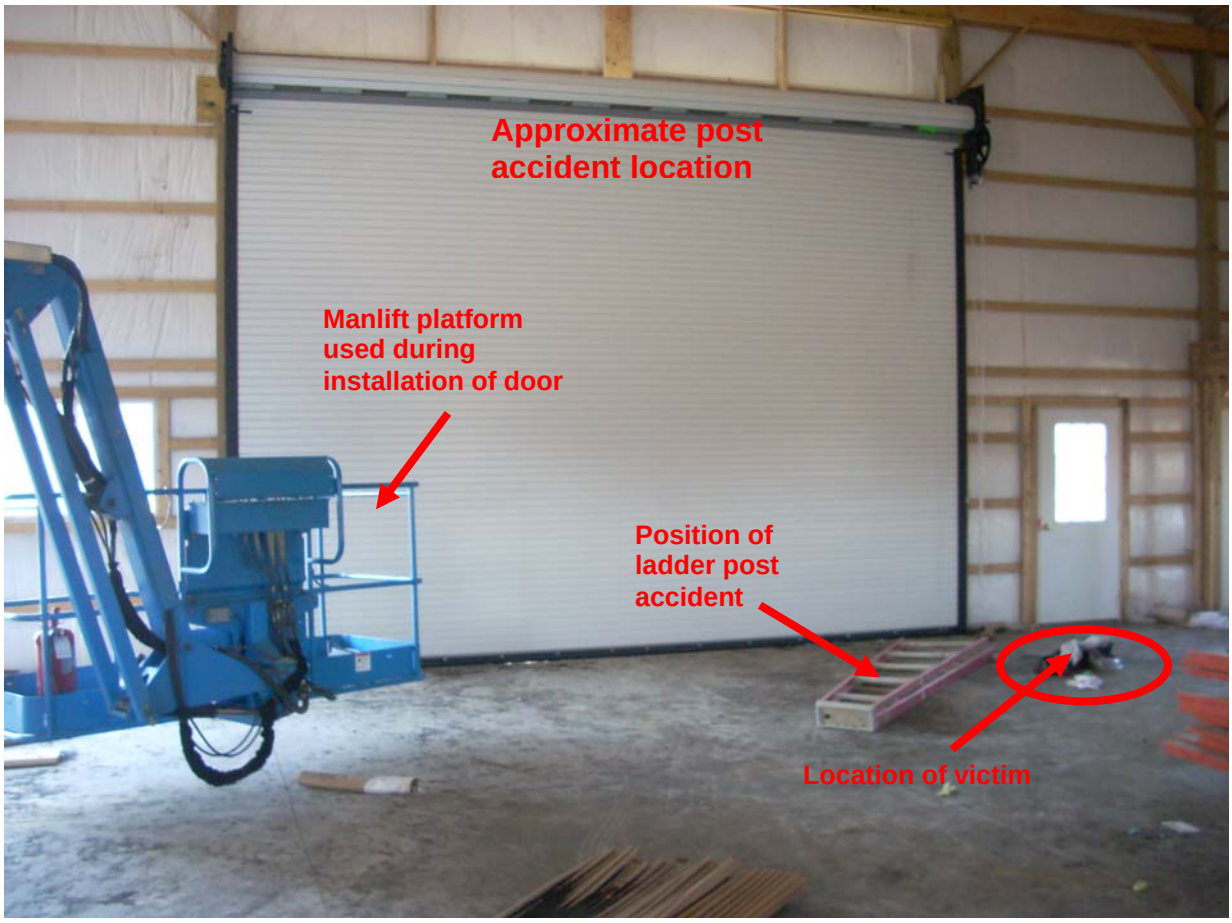
Photo of the Accident Site



OVERVIEW

On February 26, 2009, at approximately 2:08 p.m., David W. McCarty, a contract garage door installer received fatal injuries while he assisted in the installation of a rolling steel overhead door. McCarty was positioned on a 10 foot step ladder as he and a co-worker tested the tension on the door. The door began to descend from the fully opened position and struck the ladder. McCarty fell, striking his head on the concrete floor below.

GENERAL INFORMATION

Minuteman Fines Recovery Plant is operated by Covol Fuels No. 2, LLC and the parent company is Headwaters, Inc. It is located three miles north of Western KY parkway at exit 53, on State Hwy 181. At the time of the accident, the facility employed 21 surface miners working two 12-hour production shifts; producing 500 tons of coal daily.

The principal officers for the mine at the time of the accident were:

Mark Keller ..... Plant Manager / Director of Safety and Training
Warren Teague ..... Superintendent

The principal officers for the corporate office at the time of the accident were:

Kenneth Frailey ..... President
Harlan Hatfield ..... Vice President
Mike Hampton ..... Corporate Director of Regulatory Compliance
Kirk A. Benson..... Chief Executive Officer
Scott K. Sorensen..... Chief Financial Officer

A regular safety and health inspection was in progress at the time of the accident by the Mine Safety and Health Administration (MSHA). The total injury incidence rate for the mine in 2008 was 0.00 compared to a National injury incidence rate of 2.79 for preparation plants.

DESCRIPTION OF ACCIDENT

On February 26, 2009, McCarty reported to work at his regularly scheduled time of 7:00 a.m. McCarty and Jeremy Means were assigned the task of installing a 12' X 12' rolling steel overhead door in a building under construction at the Minuteman Plant, located in Muhlenberg County, Kentucky. McCarty was the lead man for this task. Both men arrived at the mine site at 9:39 a.m. Contractor representative Michael Boling, of H & B Builders, met the men at the entrance to the mine and escorted them to the work site.

Once at the work site, Boling informed McCarty and Means that a 20′ x 14′ door was to be installed rather than a 12′ x 12′ door as originally planned. Means notified his supervisor, Jeff Rothschild, of the change in plans and was instructed to install the 20′ x 14′ door. H & B Builders were to observe the installation procedures so they could install the 12′ x 12′ door at a later time. McCarty and Means began the process of installing the door. (See Overhead Door Assembly Process in the Discussion portion of this report). Assembly continued to the point where the tension of the door needed to be tested. The rolling steel curtain, made up of interlocking 20 gauge steel slats (See Figure 1) that fit into steel guides mounted on either side of the door opening, was not blocked, supported or otherwise prevented from unintentional motion at this point in the installation process. Consequently, the curtain was free to unwind to the floor.

With the installation nearly complete, Means and McCarty decided the spring was loaded with too much tension and proceeded to take some tension off the spring by reversing the tension wheel. Means used a man-lift to position himself for work on the tension wheel. As Means adjusted the spring tension at the tensioning wheel, McCarty positioned himself on a ten foot step ladder in the door opening directly under the curtain, but on the opposite side of the door opening from Means. McCarty was on the hoist drive side of the door opening. The two men tested the spring tension using their hands to pull down on the curtain. As the curtain descended it continued to travel the full distance, striking the ladder on which McCarty was standing. McCarty was near the third step from the top of the ladder when the door struck the ladder, causing him to fall, striking his head on the concrete pad.

Means witnessed McCarty fall. Two of the three H & B Builders' employees on site, Boling and Joey Hazelwood, were inside the building at the time of the accident and heard the door fall but were not looking directly at the work activity at the time. Boling stated he heard the door fall and turned to see McCarty as he struck the floor. Boling and Means responded to McCarty's aid immediately. Realizing the possible seriousness of the injuries, Boling immediately called 911 and went to the gate to meet the ambulance service. Hazelwood left the accident scene and entered the preparation plant where he located and notified the Plant Operator, Bobby Oldham, who notified the Plant Superintendent, Warren Teague. Teague responded to the accident scene and conducted a visual assessment of McCarty. Teague, realizing the potential seriousness of the injury, called the National Guard Post adjacent to mine property and requested their assistance. Teague began his physical assessment and initial care of McCarty. Two National Guard paramedics responded promptly and assumed care for McCarty. Two emergency medical technicians (EMTs) from the Muhlenberg County Ambulance service responded within five minutes of the National Guard's arrival. Both groups provided care and transported McCarty to the nearby National Guard helicopter pad where he was life flighted via PHI Air Medical, to St. Mary's hospital in Evansville, Indiana. McCarty was pronounced dead at 12:25 a.m. on February 27, 2009.

INVESTIGATION OF THE ACCIDENT

At 2:30 pm on February 26, 2009, the secretary for Minuteman Fines Recovery Plant, Mary Lynn, notified MSHA Coal Mine Inspector (CMI), William Barnwell, that an employee received potentially life threatening injuries while installing an overhead door at the new warehouse/shop construction site. Barnwell advised her to immediately contact the MSHA 1-800 Line to report the accident in accordance with 30 CFR § 50.10. Assistant District Manager, Ted Smith, assigned CMI Barnwell as lead investigator and immediately dispatched him to the accident site. The accident site was examined, equipment was inspected, and interviews were conducted. MSHA Technical Support was requested to conduct in-depth analysis of the overhead door involved in the accident. The testing was conducted on March 2, 2009.

DISCUSSION

MANAGEMENT STRUCTURE:
At the time of the accident, three separate independent contracting companies were involved in the construction of the warehouse/shop. SEE APPENDIX B.

ACCIDENT SCENE:
The accident occurred while installing a 20′ x 14′ overhead door. The 40′ x 70′ building was near completion. The exterior of the building and concrete floor were finished. The work remaining included some electrical wiring, interior finish work for office walls and the installation of two overhead rolling steel doors. SEE APPENDIX C.

OVERHEAD DOOR INFORMATION:
The overhead door involved in the accident was a C.H.I. Model 6202 Series 6000 Insulated Rolling Steel Door, manufactured by C.H.I. Overhead Doors Inc. The manufacturer's unique identifying number for this door was 72034. The door measured 20′ x 14′ and weighed approximately 2,400 lbs. The door's dominant feature was an insulated curtain made up of interlocking 20 gauge steel slats that fit into steel guides mounted on either side of the door opening. The curtain weighing 1,803 lbs hung on a steel tube called the barrel in which the door's torsion spring was housed. There was a tension adjuster on one end of the 8″ diameter barrel and a hoist drive gear on the other. The barrel was held in place on head plates bolted into the door jambs and was to be covered with a sheet metal hood that fit inside the head plates. These features can be seen in Figures 1 and 2. The door was new from the manufacturer and was in the process of being installed.

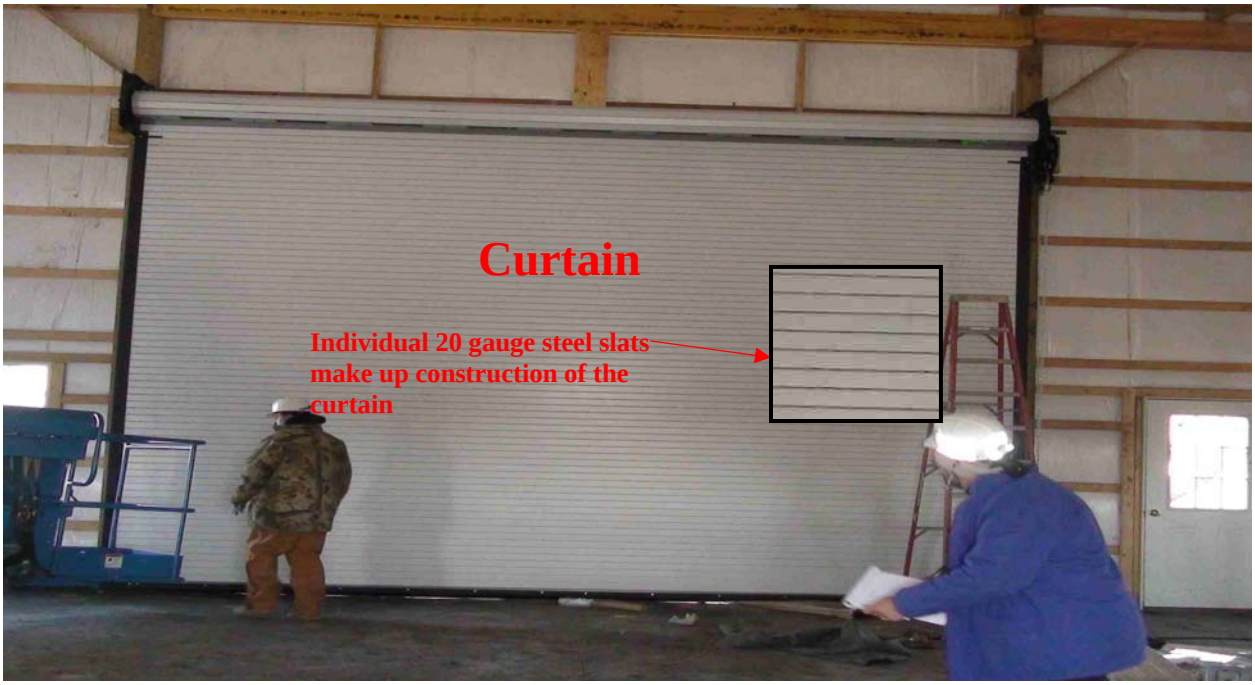


Figure 1. Door view – Full curtain straight on

Figure 2. Door views – drive gear side (l), tensioning wheel side (r).

OVERHEAD DOOR ASSEMBLY PROCESS:

Covol Fuels hired Lambert Post and Frame to build an equipment shop for their fines recovery plant. Lambert in turn hired H&B Builders to frame the building. H&B Builders had no experience hanging rolling steel doors, so Lambert contracted Evansville Garage Door Company for that specific job. Prior to the accident, the installers opened the box containing the door assembly and located the pieces required for assembling the door and then began to attach the curtain guides to the door jambs.

After the guides were in place, Means and McCarty began to assemble the barrel by attaching the tension wheel and the hoist drive gear. Means noticed that one or more gears in the hoist drive assembly had been installed backwards. Means re-installed the gears correctly and reassembled the hoist drive. Means then discovered the key stock, one of the critical pieces to the hoist drive gear, was too small and he asked an employee from H&B Builders to get the right sized key stock. Means and McCarty

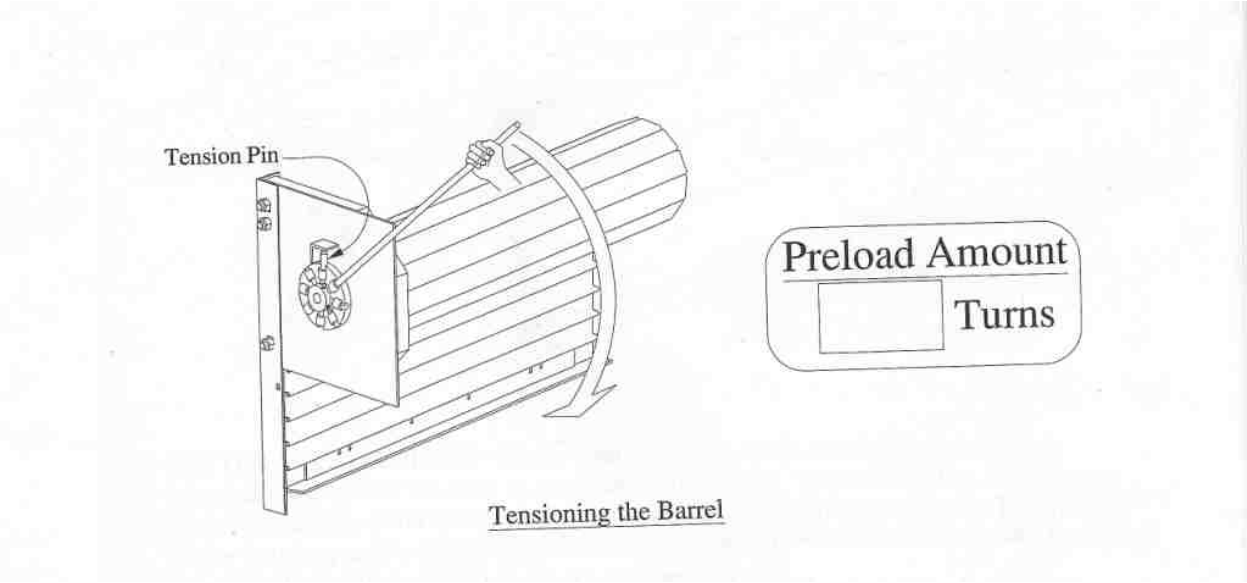
continued assembling the barrel before the new key stock arrived. A 2006 Skytrack Forklift (Serial # 0160016081) was used to elevate the barrel to allow the tension side and the drive side assemblies to be bolted onto the ends of the barrel. Attaching the tensioning wheel and the hoist drive gear using hoisting equipment to lift the barrel is consistent with the directions found in the C.H.I. Installation Instructions 6000 Series Service Door, Copyright 2007 C.H.I. Rolling Steel Doors 05/07.

After the tensioning wheel and the hoist drive gears were attached, the forklift was used to hoist the entire assembly into position for bolting at the top of the door. With the barrel in place, the installers then used the forklift to hoist the rolled curtain for bolting onto the barrel. Means and McCarty bolted the curtain onto the barrel and kept the forklift under the curtain for support.

To roll the curtain on to the barrel from the forks of the forklift, the installers directed the forklift operator to lower the forks two to three feet, which allowed a short length of curtain to spool off. Means used a man lift to position himself near the tensioning wheel so he could apply tension to the spring as the forklift operator slowly raised the forks lifting the rolled curtain. The combination of tensioning the spring and lifting the curtain roll allowed the spooled off section of curtain to wind on to the barrel. These steps were repeated until all but about two feet of curtain rolled onto the barrel. Means did not count the number of turns that had accumulated on the tension wheel while he performed these steps. The installers decided the forklift was no longer needed to hoist the curtain and permitted it to move to another work area. Nothing was substituted to securely block the curtain in its raised position when the forklift was permitted to move away. The curtain in this state was free to unwind to the floor.

With the installation nearly complete, Means and McCarty decided the spring was loaded with too much tension and proceeded to take some tension off the spring by reversing the tension wheel. Means positioned himself to work on the tension wheel using a man lift basket. Means inserted an adjusting bar into the lug sockets on the tensioning wheel and began to de-tension the spring. Refer to Figure 3 to view an illustration of the tensioning procedure. Means relied on his past installation experience to make the adjustment by feel instead of counting the number of turns on the tension wheel.

Figure 3. Illustration for tensioning procedure from page 12 of the C.H.I. Installation Instructions. Note box to record turns for recommended preload tension.



As Means adjusted the spring tension at the tensioning wheel, McCarty positioned himself on a ten foot step ladder in the door opening directly under the curtain, but on the hoist drive side of the door opening opposite from Means. The two men tested the spring tension using their hands to pull down on the curtain. The door was not tensioned as much as the installers expected, and the curtain descended, striking the ladder on which McCarty was standing. At the moment the door began its descent, McCarty's arms were extended above his head to help Means test the spring tension. McCarty was still on the third step from the top when the ladder moved from the force of the descending curtain.

CORRECT PROCEDURE:

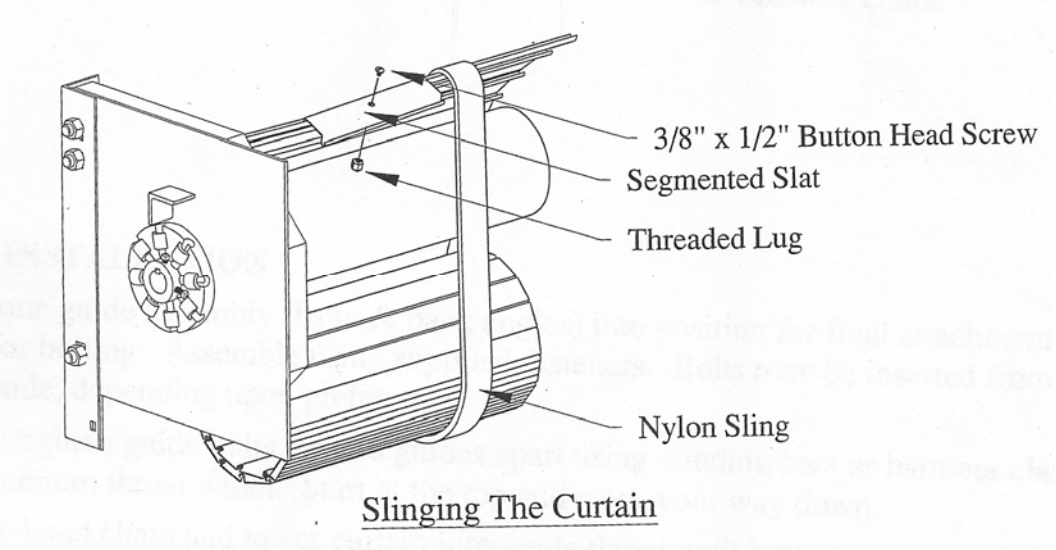
Means and McCarty deviated from the C.H.I. installation instructions at several points and did not always use other means to satisfy critical safety factors detailed in the instructions. For example, page 12 of the instructions include warnings in bold faced print that the spring is very dangerous when under tension and to never exceed the recommended number of turns by more than a half of a turn. The installation procedures instruct the installers to record the number of pretension turns inscribed on the barrel shaft in a designated space on page 12 of the instructions. Knowing the number of turns recommended from the manufacturer permits installers to preload the spring with the proper amount of tension without having to feel and guess the correct amount of preload tension after the curtain is installed. Recording the number of turns on page 12 can prevent this information from being lost when the curtain covers the inscription later in the assembly process. This step was twice emphasized with reminders in bold faced print on pages 6 and 10, but neither installer recorded the

number in the instruction book or in another location so it would be available when needed.

The instructions direct installers to make the chain hoist operational before the barrel is mounted on top of the door. This requires, among other things, inserting the correctly sized key stock into the chain hoist drive gear. Making the chain hoist operational at this point in the assembly process ensures the hoist will be available for installing the curtain once the barrel assembly is mounted. Means and McCarty could not use the chain hoist until the correctly sized key stock was provided. They proceeded to load the curtain on the barrel using the tensioning spring rather than the chain hoist. Loading the curtain in this manner put an unknown amount of tension on the spring before the curtain was completely installed.

Installers are directed to fasten slings over the barrel to support the curtain during installation according to the C.H.I. Installation Instructions. Refer to Figure 4 for an illustration of the suggested sling configuration. The specifications for the sling assembly, found on page 10 of the instructions, direct installers to use a minimum of two straight eye nylon slings rated at no less than 5,000 lbs each and fastened with screw pin shackles rated at no less than 10,000 lbs. The slings are not to be removed until the proper preload tension is set and the top guide rail sections have been checked for secure installation. Means and McCarty used no slings during the installation process, but did support the curtain with a fork lift during part of the installation.

Figure 4. Curtain sling illustration from CHI Installation Instructions.



The C.H.I. Installation Instructions state that when preparing to adjust the spring tension, vice grips should be applied a few inches below the top of the curtain guides on either side of the door. The vice grips, if positioned as instructed in the C.H.I. Installation Instructions, would have prevented the descent of the curtain. Means said that no vice grips were used to block the curtain during this installation, and no other blocking device was put in place.

TESTING:
The investigation team conducted testing to determine if the torsion spring inside the barrel had catastrophically failed, causing the curtain to release. Since the door is designed for the spring to be at maximum tension when the curtain's bottom edge is on the floor, the investigation team decided to verify tension on the spring by trying to turn the tension wheel. The external parts of the tension assembly were visually examined and no defects were detected. An adjusting bar was then inserted into the tensioning wheel and pulled down to test the tension on the spring. The wheel did not move even under the full weight of the installer, which is what one would expect if the spring was holding tension.

Concluding the spring was holding tension, the investigation team checked to see if the door would open using the chain hoist. The chain hoist gears were inspected and no damage or defect was detected. A correctly sized key stock, which was not available at the time of the accident, was inserted between the drive shaft and the drive wheel. The remaining top front guide angle was then installed and the door, with the exception of the sheet metal hood covering the barrel, was completely assembled. From the floor, Means raised and lowered the curtain by pulling on the hoist's chain. After observing the successful operation of the chain hoist, the investigation team concluded that all components of the door assembly were functioning as intended.

SUMMARY:

1) During the installation of the door, the curtain was not restricted, secured or adequately blocked to prevent it from being a hazard to those below.
2) The installers deviated from the manufacturer's installation instructions and failed to substitute other means to address critical safety factors detailed in the instructions.
3) The ladder was placed in a location that allowed the descending curtain to strike the non-step legs.
4) Testing of the tension on the torsion spring did not reveal any defects.
5) Operating the door using the chain hoist did not reveal any defects.

WORK PROCEDURES/TRAINING:
McCarty had approximately 12 years experience installing garage doors. However, he had no mining experience or experience working on mine property. Mine Safety and Health Training Specialist, Joe R. Fritz, conducted an examination for any training requirements specific to McCarty and the task of installing the overhead door. McCarty is classified as a construction worker performing a specialized task and is exempt from the normal Part 48 training required for "miners." The only training required is hazard training, which McCarty and his co-worker did not receive. The hazard training would have instructed McCarty on basic mine-related hazards unrelated to the work he was performing. Therefore, the lack of this training did not contribute to the accident.

HUMAN FACTORS:
McCarty was 50 years of age. He tested positive for tetrahydrocannabinol (THC) with a preliminary admission urine drug screen at the St. Mary's hospital. Blood tests were positive for CANNABINOIDS, THC, tetrahydrocannabinol carboxylic acid (THC-COOH), ANESTHETICS, STIMULANTS (caffeine) and Rocuronium (Zemuron).

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic cause of the accident that was correctable through reasonable management controls. During the analysis, a root cause was identified that, if eliminated, could have either prevented the accident or mitigated its consequences.

The root cause listed below was identified during the analysis and the corresponding corrective actions implemented to prevent a recurrence of the accident:

Root cause: The steel curtain was not blocked from motion during the installation of the door as required in the manufacturer's installation manual.

Corrective Action: The mine operator has implemented a program whereby all contractors entering mine property will receive additional instruction requiring them to follow the manufacturer's recommended procedures for installation or removal of any and all equipment, devices and products.

CONCLUSION

The manufacturer's recommended installation procedures were not being followed. The sequence of events in which the door was to be installed along with the requirement to install slings on the curtain to prevent unintentional movement during the installation of the door was ignored. The curtain rolled down unintentionally, striking the ladder and causing McCarty to fall. This failure to follow the manufacturer's installation procedures and/or lack of knowledge to take the appropriate actions resulted in the accident.

Approved By:

Carl E. Boone II
District Manager

8/20/9
Date

ENFORCEMENT ACTIONS

1. A 103(k) Order, No. 8492251, was issued to Minuteman Fines Recovery Plant, ID 15-19205 stating "This 103 (k) Order is issued to insure the health and safety of miners during an accident investigation at the new shop building located just behind the processing plant. No one is allowed to enter the building except employees designated by the operator, state and federal officials involved with the investigation of the accident."

2. A 104(a) Citation, No. 8492581, was issued citing 30 CFR § 77.405(b) to Evansville Garage Door Company, Contractor ID W824 stating, "The contractor employed by the operator had not securely blocked the overhead rolling steel door being installed in a newly constructed surface structure on the site of Minuteman Plant for Covol Fuels, Greenville, KY. Contractor, Evansville Garage Door Company, employees were installing a 20' x 14' door weighing 1,803 pounds when the door began to descend. It contacted the ladder from which one of the employees fell, causing fatal injuries."

Appendix A

Persons Participating in the Investigation
Persons Interviewed

Covol Fuels No 2, LLC

Mark Keller .....Plant Manager / Director of Safety and Training
Warren Teague.....Superintendent

Evansville Garage Door Company, ID W824

Bob Rothschild .....Owner/President
Jeremy Means ..... Lead Man/Laborer

H & B Builders (no ID)

Michael Boling .....Partner/laborer
Roger Boling .....Partner/Laborer
Joey Hazelwood .....Partner/Laborer

Mine Safety and Health Administration

William Barnwell .....Coal Mine Safety and Health Inspector
Eugene D. Hennen .....Mechanical Engineer, Approval and Certification Center
Dean S. Nichols .....Mechanical Engineer, Approval and Certification Center

Appendix B
Management Structure

MINUTEMAN FINES RECOVERY PLANT, ID 15-19205
(Contract with Lambert Post/Frame Sales)

Mark Keller ..... Plant Manager/Director of Safety and Training
Warren Teague ..... Superintendent

EVANSVILLE GARAGE DOOR COMPANY, ID W824
(Contract with Lambert Post/Frame Sales to install a 12 x 12 overhead door)

Bob Rothschild ..... Owner/President
Jeff Rothschild ..... Supervisor
David W. McCarty ..... Lead Man/laborer
Jeremy Means ..... Lead Man/laborer

H & B BUILDERS, No ID
(Contract with Lambert Post/Frame to construct building)

Michael Boling ..... Partner/laborer
Roger Boling ..... Partner/laborer
Joey Hazelwood ..... Partner/laborer

Appendix C

40’ x 70’ Warehouse/Shop under construction