

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

REPORT OF ACCIDENT

Surface Nonmetal Mine
(Cement)

Ignition

January 7, 2003

Circle 4M Welding and Fabrication
Contractor I.D. No. E556

at

TXI
Midlothian Quarry and Plant
Midlothian, Ellis County, Texas
Mine I.D. No. 41-00071

Investigators

Ralph Rodriguez
Supervisory Mine Safety and Health Inspector

Jerry Y. Anguiano
Mine Safety and Health Inspector

Stephen B. Dubina
Electrical Engineer

Clete R. Stephan
Principal Mining Engineer

David L. Weaver
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
South Central District
1100 Commerce St., Room 462
Dallas, TX 75242

Edward E. Lopez, District Manager

OVERVIEW

On January 7, 2003, Gordon Rutherford, welder, age 34, suffered fatal burns when fumes ignited inside an absorption tank (scrubber).

The victim and three co-workers were working in pairs from two man-lifts. They were replacing an air duct expansion joint and were air arc gouging a section of the duct to remove an end flange. Molten metal fell inside the scrubber and onto the mist eliminator causing it to catch fire and produce vapors that ignited.

The cause of the accident was the failure to protect the polypropylene mist eliminator from the molten metal particles resulting from the air arc gouging. A contributing cause was the failure to provide task training in addition to site specific hazard awareness training that addressed all of the health and safety aspects of the task the contractor was to complete.

GENERAL INFORMATION

Midlothian Quarry and Plant, a limestone quarry and cement plant owned and operated by TXI, was located 30 miles south of Dallas in Ellis County, Texas. The principal operating official was James Owens, plant manager. The quarry operated two 10-hour shifts per day, 5 to 6 days a week and the plant operated two 12-hour shifts per day, 7 days a week. Total employment was 269 persons.

Limestone was ripped by dozer and transported by front-end loaders to a crusher located in the pit. Crushed material was transported by conveyor belt to the plant where it was processed into cement. The finished cement was transported to customers by rail and trucks.

Circle 4M Welding and Fabrication was an independent contractor located in Blooming Grove, Texas. TXI contracted with Circle 4M and owner Matthew Adkins to perform maintenance and welding at the plant. The victim was an employee of Circle 4M.

The last regular MSHA inspection at this operation was completed on June 27, 2002.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Gordon Rutherford (victim) reported to work at 7:00 p.m. Rutherford, along with Circle 4M employees Carl Carney, Brent Wickliffe, and Rodney Wilhoite, were assigned to remove a metal flange from a section of an elevated air duct that connected to the scrubber outlet. The flange was to be removed by air arc gouging around the circumference of the air duct.

At 9 p.m., after making preparations for the job, Carney and Rutherford used a man-lift to access the east side of the air duct while Wickliffe and Wilhoite used another man-lift to access the west side. One employee in each man-lift then proceeded to burn out the flange around the air duct, starting at the top. The other employee in each man-lift stood watch and assisted.

Each pair had removed 6 to 8 feet of the flange by 10:45 p.m. when flames were seen coming from the bottom of the scrubber outlet. Wickliffe and Wilhoite lowered their man-lift to near the bottom of the air duct while Carney and Rutherford ceased working and waited. Wilhoite used a small extinguisher to douse

the fire inside the scrubber outlet. After waiting a few minutes to ensure flames were not visible, first Carney and Rutherford then Wickliffe and Wilhoite resumed gouging near the top of the air duct.

After gouging about another foot of the air duct, Wilhoite was alerted by Wickliffe that there was heavy smoke coming from the scrubber outlet. The smoke quickly overcame Carney and Rutherford, making it difficult for them to see or breathe. Flames then erupted from the scrubber outlet and damaged the control cable for the basket of the man-lift that Carney and Rutherford were using. Realizing the basket would not respond to their attempts to move it using the controls, Carney unhooked both his and Rutherford's safety lanyards before he climbed out of the basket and onto the air duct. Carney looked back from on top of the air duct, only to discover that Rutherford had not followed him out of the basket. He then felt an ignition as he scrambled away from the fire and smoke.

As the fire erupted, Wickliffe and Wilhoite lowered their man-lift basket to the ground. By this time, Carney had escaped the fire and Rutherford had either jumped or had fallen to the uppermost scrubber platform. Carney was given first aid then transported to Parkland Hospital. Rutherford had been severely burned and was pronounced dead at the scene. The cause of death was attributed to burns.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 12:48 a.m. on January 8, 2003 when TXI safety director Dan Paine phoned assistant district manager Michael Davis. An investigation was begun the same day and a 103(k) order was issued to ensure the safety of miners. An MSHA investigation team inspected the accident scene, interviewed witnesses, and reviewed policies, procedures, and training records. The management and employees of TXI and Circle 4M assisted in the investigation.

DISCUSSION

Location of the Accident

The accident occurred at the exhaust duct outlet on the scrubber tank located near the southeast corner of the plant.

Weather Conditions

The night of January 7 was clear with temperatures below 40 degrees Fahrenheit and winds of 15 miles per hour from the west. The ground in the vicinity of the scrubber was level and dry.

Contract Work

As part of Circle 4M's ongoing contract, they had been given the specific task of replacing the expansion joint between the scrubber outlet and the exhaust air duct. Circle 4M day shift crew had cut out the old expansion joint. Rutherford and three other Circle 4M employees were in the process of removing an end flange from one end of the air duct to prepare for the new expansion joint.

Absorption Tank (Scrubber)

The scrubber was a 40 foot diameter by 90 foot high tank designed to filter exhaust gases from the pre-heater dust collectors. The inside of the scrubber held two levels of mist eliminators constructed of polypropylene. Empty 4-inch diameter fiberglass piping was also located inside the scrubber. Metal stairs and platforms provided access for maintenance on the exterior of the scrubber.

The mist eliminator appeared to be metal grating to the employees working from the man-lifts. The mist eliminator consisted of sections that were laid wall-to-wall on inverted steel T-beams about 2 feet below the bottom edge of the scrubber outlet duct. Each section was made of multiple snap together layers of T-271 polypropylene and weighed 4.9 pounds per square foot (psf). The mist eliminator located on the lower level was similar to the upper level except that it was made of T-272 polypropylene and weighed 3.4 psf.

The polypropylene had a melting temperature of 345°F and a flash temperature of 693°F. MSDS sheets stated that it should be kept away from sparks and open flames. Emissions from the burning polypropylene included carbon, carbon monoxide, and carbon dioxide.

The fiberglass piping did not melt at 572°F in laboratory tests but had a flash ignition temperature of 777°F.

The scrubber outlet duct was 16 feet in diameter and extended about 4 feet from the side of the scrubber, near it's top. The outlet duct was about 75 feet above the ground and was accessible from the uppermost scrubber platform.

Exhaust Air Duct

The exhaust air duct from the scrubber was 16 feet in diameter and was constructed from short sections fabricated from ¼ inch stainless steel. The air duct was level with the scrubber outlet and extended north, away from the scrubber.

The expansion joint being replaced was a 28 inch wide rubber ring that was bolted into place between the scrubber outlet and the exhaust air duct. This ring was to be replaced with a 12 inch wide rubber ring.

Man-lifts

The two man-lifts were diesel-powered JLG models with dual controls. One set of controls was located on the man-lift frame while the other was located in the basket. Carney and Rutherford were in a 1996 model 120HDX-4WD with a maximum reach of 120 feet. It was parked on the east side of the scrubber and air duct.

Gouging Equipment

The four employees were air arc gouging the steel flange. In this process, the metal was melted with an arc welding machine and blown from the cut with compressed air.

Carney and Rutherford were using a diesel-powered Lincoln welding machine and copper-clad, carbon welding rods to generate enough heat to melt the steel. There were two air compressors at the scene. One was an Air/Arc K4000 and the other was a Pro Fax model.

Training

Rutherford had a total of 10 years experience as a welder. He had worked 2 weeks at this location. Rutherford had received all required 30 CFR Part 46 training from Circle 4M. However, he did not receive mine site specific hazard training from TXI on the task being performed.

Prior to commencing the coupling replacement, Kenneth Upchurch, TXI maintenance planner, and Adkins discussed the job. They did not develop a formal task analysis nor did they discuss the presence of the polypropylene mist eliminator.

ROOT CAUSE ANALYSIS

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

Causal Factor: A task analysis to determine possible hazards and establish safe work procedures had not been completed for modifying the air duct expansion joint.

The modification included air arc gouging that produced molten metal. Two combustible plastic membranes were located inside the scrubber, a few feet from the air arc gouging.

Corrective Action: A task analysis should be conducted for all repair and maintenance work to identify all potential hazards. Procedures should be established to eliminate hazards and should address the proper steps to safely complete the job.

Causal Factor: The contractor was unaware that a combustible membrane was located inside the scrubber tank. The production operator failed to provide the contractor's employees with information concerning the filter membrane prior to assigning them to perform the repair task.

Corrective Action: A plan should be developed to ensure that maintenance and repair tasks are analyzed prior to commencing work. Procedures should be established to address all hazards to ensure safe completion of the task. Persons performing maintenance and repair tasks should be trained regarding the specific health and safety hazards and they should be knowledgeable of the established procedures to complete the task.

CONCLUSION

The victim and three co-workers were working in pairs from two man-lifts. They were replacing an air duct expansion joint and were air arc gouging a section of the duct to remove an end flange. Molten metal fell inside the scrubber and onto the mist eliminator membrane causing it to catch fire and produce vapors that ignited.

The cause of the accident was the failure to protect the polypropylene mist eliminator membrane from the molten metal particles resulting from the air arc gouging. A contributing cause was the failure to provide task training in addition to site specific hazard awareness training that addressed all of the health and safety aspects of the task the contractor was to complete.

Root cause included the following: failure to conduct a task

analysis to determine possible hazards and establish safe work procedures to complete the repair work; failure to inform the contractor that the mist eliminator was combustible; and failure to ensure the contractor's employees were informed of the site specific mine hazards related to the task they were hired to perform.

ENFORCEMENT ACTIONS

Citations/Orders issued to TXI

Order No. 6222507 was issued on January 8, 2003 under provisions of Section 103(k) of the Mine Act:

A fatal accident occurred at this operation on January 7, 2003 when an unplanned ignition occurred while a contract employee was attempting to remove two mild steel flanges to replace them with stainless steel flanges. A verbal 103k order was issued to Daniel W. Paine at 12:01 a.m. by Mike Davis to close the affected area until an accident investigation could be conducted to determine the cause of the unplanned ignition. All levels of the scrubber tower, the two JLG 120HX man-lifts #80656068 and #326648 to include all equipment and tools inside the barriers.

This order was terminated on January 10, 2003 after all hazards created by the accident had been removed.

Citation No. 6201540 was issued on May 16, 2003 under the provisions of Section 104(a) of the Mine Act for violation of 30 CFR 46.12(a)(2).

A contract welder was fatally injured at this mine on January 7, 2003, when flames engulfed him. The victim was burning a metal flange on a duct when hot material fell inside a scrubber tank, igniting a combustible membrane causing the fire. The production operator failed to provide information to the contractor regarding the presence of a combustible membrane and site-specific hazard information pertaining to it.

This citation was terminated on June 23, 2003 when the company addressed site-specific hazard training that was relative to the task being performed by contractors.

Citation No. 6201541 was issued on May 16, 2003 under provisions of Section 104(a) of the Mine Act for violation of 30 CFR 56.4500.

A contract welder was fatally injured at this mine on January 7, 2003, when flames engulfed him. The victim was burning a metal flange on a duct when hot material fell inside a scrubber tank, igniting a combustible membrane causing the fire. The production operator failed to take any precautions to separate the combustible membrane from possible hot material that resulted from burning the metal flange adjacent to the scrubber tank.

This citation was terminated on June 23, 2003 the company implemented a "hot work" permit plan that included the scrubber.

Approved by:

Date:

Edward E. Lopez
District Manager

APPENDICES

A. Persons Who Participated in the Investigation

B. Persons Interviewed

C. Accident Investigation Data (MSHA Forms 7000 a/b)

APPENDIX A

Persons Who Participated in the Investigation

TXI

| | |
|--------------------|-------------------------|
| Brian Bottleberghe | production manager |
| William Brown | project engineer |
| Dan Paine | safety coordinator |
| Larry Ratliff | safety manager |
| Ronnie Waxler | assistant plant manager |

Mine Safety and Health Administration

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|------------------------|--|
| Jerry Y. Anguiano | mine safety and health inspector |
| Stephen B. Dubina | electrical engineer |
| Clete R. Stephan, P.E. | principal mining engineer |
| Ralph Rodriguez | supervisory mine safety and health inspector |
| David L. Weaver | mine safety and health specialist |

APPENDIX B

Persons Interviewed

TXI

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|--------------------|--------------------------|
| James V. Doshier | process control operator |
| Tim T. Pate | welder |
| Paul E. Percifield | maintenance |
| George C. Wiggins | maintenance |

Circle 4M Welding and Fabrication

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|--------------------|--------|
| Matthew T. Adkins | owner |
| John C. Carney | welder |
| Brent A. Wickliffe | welder |
| Rodney Wilhoite | welder |