A plant operator at a coal fired power generation plant in Texas, died when he fell between the bypass dampers located in the flu gas desulfurization unit.

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SUMMARY

On April 10, 1998, a 32-year-old, male plant operator (the victim) was performing regularly scheduled maintenance on bypass dampers in the flu gas desulfurization unit at a power generation plant. The victim descended a ladder to the level of the bypass dampers which are eight feet below the walking surface and 41 feet above the bottom of the shaft. The victim attempted to retrieve a piece of plywood left nearby. He was wearing a full body harness but did not immediately hook his safety line to the cable that had been installed as part of a fall protection system. The victim took one step forward, reached down, and retrieved the plywood. When he stood up and stepped back, he fell between the damper blades to the bottom of the shaft 41 feet below. The victim struck his head on a cross member that was approximately two feet up from the floor. Emergency medical service personnel entered the shaft through an access door located at the bottom of the shaft and then transported the victim to a local hospital.

The TX FACE investigator concluded that to reduce the likelihood of similar occurrences, employers should:

**** design a fall arrest system and include it as part of the required personal protective equipment (PPE) for employees who perform work in this area.***

**** provide a training program for each employee who might be exposed to fall hazards***.

**** perform a job safety analysis (JSA) to determine what hazards employees may encounter while performing their work.***

**** develop an emergency action plan for employees that describes the rescue and medical duties to follow and ensures that all employees are knowledgeable of those procedures.***

INTRODUCTION

On April 10, 1998, a 32-year-old, male plant operator died when he fell between the bypass dampers located in the flu gas disulfurization (FGD) unit. The TX FACE program officer was made aware of the incident by the area OSHA office on April 20, 1998. A visit to the site was not possible because the area involved can only be accessed when the plant is shut down. Pictures of the area were taken by company officials and these were reviewed on May 15, 1998, when the senior safety representative and the safety consultant were interviewed. The sheriff's and OSHA's report were obtained. The justice of the peace and EMS personnel were also contacted.

The employer is a utility company operating a power generation plant. The company employs 950 workers at this plant, 145 of whom perform the same duties as the victim. This plant has been in operation for 13 years. There was one other worker at the site at the time the incident occurred. The plant operates continuously except when annual maintenance is performed and is closed for four weeks.

The safety program is managed by a full-time safety director and a safety consultant. A written safety program is in place. It includes written procedures; however, this particular task was not addressed. Safety meetings are conducted on a weekly basis. In addition, prior to starting work, a pre-task safety meeting is conducted by those involved.

New hire training is conducted and consists of assigning the new employee to a supervisor who is responsible for training. Refresher training, along with task-specific training is included in the safety program. Training is conducted in the classroom and on the job at the job site. Some training is self-paced. The company conducts pre-employment physicals and drug screening.

The victim had been employed with the company for 12 years. The victim had been trained to do this task and had successfully performed this task at least four or five times previously.

INVESTIGATION

The power generation plant had been shut down in order to conduct annual maintenance and clean up. The maintenance process involves working on bypass dampers located in the flu gas disulfurization (FGD) unit. The FGD unit channels exhaust gases into the atmosphere and is accessed through a door on the FGD stack. The FGD stack is ventilated prior to entering.

The dampers themselves are 2 feet wide and 9 feet long. They are mechanically connected during normal operations so they can be opened from a remote location when the need arises. The dampers operate similar to louvers -- they are open when they are in the vertical position and closed when in the horizontal position.

Work crews entered the area after ventilation was completed and then proceeded down a ladder to where the dampers are. The area is 26 feet by 181/2 feet and is surrounded by a wall 18 inches high. Workers must descend eight feet to reach the area. A folding step ladder, 12 feet in length, was placed in the opening and the bottom rung of the ladder rested on top of the bearing housing.

Prior to the event, the victim and a coworker had performed maintenance on one end of the louvers. (The victim had performed this task on at least four or five other occasions according to the safety manager). This task included inspecting and cleaning parts, seals, blades, bearings, linkages and checking lubrication. The victim and coworker used a sheet of plywood 8 feet long by 2 ½ feet wide to rest their knees and a 2"x12" piece of wood to rest their hands. They would move across the top of the dampers in an “inchworm” fashion.

Both workers wore fall protection equipment during the procedure. Fall protection consisted of a full-body harness and a horizontal lifeline for them to connect to. The fall protection

equipment, however, had not been rated or load tested. The horizontal lifeline was constructed in a manner that prevented employees who entered the damper from being tied off at all times.

After lunch, the victim and coworker returned to continue maintenance on the bypass dampers. The victim descended the ladder and stood on the bearing housing. This time the victim did not immediately hook his safety line to the cable that had been installed as part of the fall protection system. He had the hook tucked inside his pants.

The coworker handed a bucket containing parts and tools to the victim. After setting the bucket down, the victim noticed the plywood sheet that had been used previously. It was approximately four feet away from where he was standing on the bearing housing. As the coworker was descending the ladder, the victim took one step forward onto the hinge the dampers were attached to and retrieved the plywood. When he stepped back, the damper on which he stood rotated down to the open position and he fell between the opening and landed at the bottom of the 41-foot shaft. When the victim fell, he struck his head on a cross member that was approximately two feet up from the floor.

Coworkers immediately went to the aid of the victim. During the rescue attempt they had to navigate the duct work without the benefit of equipment such as portable lights. EMS personnel were notified at 1:24 p.m. and arrived at 1:33 p.m. They entered the FGD from an access door at the bottom of the stack. CPR was administered and the victim was transported to the local hospital. They arrived at the emergency room at 2:07 p.m. The justice of the peace pronounced the victim dead at 2:20 p.m.

CAUSE OF DEATH

The Justice of the Peace stated the cause of death on the death certificate was massive head injury.

RECOMMENDATIONS/DISCUSSION

<u>Recommendation #1</u> - The employer should design a fall arrest system and include it as part of the required personal protective equipment (PPE) for employees who perform work in this area.

Discussion. The fall arrest system is one item of PPE. OSHA 29 CFR 1910.132 requires all personal protective equipment to be of safe design and construction for the work to be performed. In this situation the system should be designed so workers connect to a lifeline or other support prior to entering a hazardous area. In this case, workers would not connect to the cable until they had descended a ladder and were standing on the bearing housing. They are at risk of a fall during this descent.

Subpart M of OSHA standard 1926 contains specific information on fall arrest systems. Although this standard technically does not apply to this situation, the requirements should be evaluated and those that are applicable incorporated in to the decision-making process for developing a fall arrest system for this task.

<u>Recommendation #2</u> - Employers should provide a training program for each employee who might be exposed to fall hazards.

Discussion. The program should enable each employee to recognize fall hazards and to be trained in the procedures to minimize fall hazards. In this incident, a fall hazard existed where workers had to descend to the bearing housing near the dampers. The potential for a fall increased when workers descended the ladder while handling a sheet of plywood and buckets of tools. Further potential existed when workers used disconnected dampers for a walking surface.

The employer should also ensure that each employee has been trained in the correct procedures for erecting, maintaining, disassembling and inspecting the fall protection systems to be used.

<u>Recommendation #3</u>: Employers should perform a job safety analysis (JSA) to determine what hazards employees may encounter while performing their work.

Discussion: Development of a JSA forces those conducting the analysis to view each operation as part of a system. In so doing, each step in the operation is assessed while consideration is paid to the relationship between steps and the interaction between workers and equipment, materials, the environment, and other workers. For example, JSA's may address ventilation and entry into the FGD, installing fall protection and its use, maintenance on the dampers, etc.

Other benefits of a JSA include: identifying hazardous conditions and potential accidents, providing information with which effective control measures can be established, determine level of knowledge and skill as well as the physical requirements that workers need to execute specific tasks, and discovering and eliminating unsafe procedures, techniques, motions, positions and actions.

<u>Recommendation #4</u>: Employers should develop an emergency action plan for employees that describes the rescue and medical duties to follow and insures that all employees are knowledgeable of those procedures.

Discussion. When the victim's coworkers first recognized that the victim had fallen, their first reaction was to come to the aid of their fellow worker. Their reactions were driven by emotion and put their own safety at risk. Many injuries and deaths to rescuers, coworkers or emergency responders, are the result of forging ahead without stopping and assessing the situation. Following formal procedures in the event of an emergency situation such as this are essential in order to avoid further injury and to make sure that the lives of those performing the rescue are not also endangered.

To the extent feasible and practical, the employer should analyze job-sites for all foreseeable emergencies. A plan based on specific events should be developed. The plan should describe what actions to take, regarding rescue and/or first aid.

In this incident the plan should address procedures for:

- summoning rescue and emergency services,

- rescuing entrants from permit-required spaces,
- providing necessary emergency services to rescued employees,
- preventing unauthorized personnel from attempting a rescue.

REFERENCES

29 CFR 1910.132 (c)&(d) Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

29 CFR 1910.146 (d) Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

29 CFR Subpart M - Fall Protection, Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.