



# STATE OF NEW YORK DEPARTMENT OF HEALTH

## FATALITY ASSESSMENT AND CONTROL EVALUATION

### Worker Dies after Falling through a Steel Grid Plate into an Underground Frozen Coal Cracker Case Report: 03NY006

#### SUMMARY

On February 11, 2003, a 42 year-old male material handling operator, who was employed at a coal-fired electrical generating plant, sustained fatal injuries as a result of falling 15 feet through a steel grid into an underground coal cracker. On the morning of the incident, coal from an emergency stockpile was transported through a ground opening that was covered by a steel grid called a “grizzly”(14’ X 14’) with 12” by 12” grid openings. Under the grizzly there was a 15 feet deep hopper, a coal cracker, and a second hopper that was 12 feet deep connected to a conveyor belt. On January 22nd, nineteen days before the fatal incident, an operator had recorded damage to the grizzly in the team’s daily log: the steel bars (1” X 10”) that formed the grids were broken and bent resulting in a 2’ by 2.5’ hole in one corner of the grizzly. A decision was made within the team not to repair the grizzly until spring. On the morning of the incident, the victim was seen by two of his co-workers (an operator and an engineer) walking on the grizzly with a shovel in his hand. It appeared that the victim was using the shovel to break the frozen coal and clear the clogged grids. Then, at approximately 9:18 AM, the engineer noticed that the shovel was left on the grizzly but the victim was gone. He immediately told the operator to shut down the coal transporting system. The victim was found on the conveyor belt 50 feet away from the grizzly. The victim apparently fell through the hole on the damaged section of the grizzly into the hoppers and the frozen coal cracker and was carried out by the conveyor belt. The operator immediately called an incident commander in the plant’s master control room. The incident commander summoned an ambulance that arrived at the site in ten minutes. The victim was transported to a local hospital where he was pronounced dead.

New York State Fatality Assessment and Control Evaluation (FACE) investigators concluded that to prevent similar incidents from occurring in the future, employers should:

- ***Repair damaged equipment in a timely manner, and place warning signs and guards immediately on and around the damaged equipment to warn workers of the safety hazard;***
- ***Develop standard procedures for emergency situations in which employees may have to walk on a grizzly and mandate the use of personal fall arrest systems; and***

- *Evaluate the effectiveness of current plant occupational safety and health management structures and establish a system that anticipates problems and provides clearly defined responsibilities and accountability.*

## INTRODUCTION

On February 11, 2003 at approximately 9:18 AM, a 42 year-old male material handling operator, who was employed at a coal-fired electrical generating plant, sustained fatal injuries as a result of falling 15 feet through a steel grid into an underground coal cracker. New York FACE (NY FACE) staff initially learned of the incident through a newspaper article on February 12, 2003. On March 5, 2003, a NY FACE investigator conducted a fatality evaluation at the power plant. During the site visit, the NY FACE investigator met the plant President as well as the Turbine Generator Team Leader who was the management safety representative. The investigator observed the coal transporting systems and equipment and examined the incident site. A union shop steward was interviewed by phone after the site visit. Additional information was collected from the Occupational Safety and Health Administration (OSHA) area office that investigated the fatal incident.

The power plant began operation in 1984 and the current owner was an international power company that purchased the facility in 1999. The coal-fired operation unit, with a power output of 676 MW (million watts), employed approximately 130 employees at the time of the incident; approximately 100 of these employees were production workers who were represented by a national labor union. The employees were assigned to eleven teams to carry out the production and administrative operations in the plant.

When the plant was purchased in 1999, most of the occupational safety and health programs that had been developed by a group of safety and health professionals working under the previous owner were continued. There were, however, some changes in the programs under the new ownership; instead of relying on full-time trained safety and health professionals to manage the programs, the plant safety responsibilities were shared among management and union representatives. At the time of the incident, the plant did not have a full-time safety or health professional. There was a Safety Steering Committee that was co-chaired by a management representative and a union representative. Each of the eleven teams of employees had a designated committee member that attended the monthly meetings and performed specific safety duties. Monthly meetings were open to all employees. The committee also conducted quarterly safety audits.

The Safety Steering Committee chairs and members were changed or rotated at least annually. At the time of the incident, the management co-chair of the committee was the Turbine Generator Team Leader who spent about 15 to 20 percent of his time dealing with plant safety issues. According to plant management, each of the other committee members spent about 10% of his or her time on team and plant safety duties.

The majority of the plant employees had worked at the plant long before the current owner purchased it. These workers had received safety and on-the-job training under the previous employer. Under the current management, safety refresher training courses were provided to

workers at the frequencies required by specific OSHA standards. The workers received refresher courses in the form of classroom training provided by outside contractors or by reviewing computer-generated training materials. New hires received orientation training through a local community college.

The victim had worked at the power plant for approximately nineteen years. At the time of the incident, he was an operator on the Material Handling Team, a position that he had held for about 12 years. This was the first fatal incident at the plant.

## **INVESTIGATION**

The Material Handling Team was in charge of transporting coal and limestone from the rail yard to the plant or storage piles. When shipments of coal arrived in rail cars at the generating plant, they first went to a dump house. To speed the dumping process, coal cars were equipped with special rotary couplings that allowed the cars to be turned upside down, spilling the coal onto conveyors. Once the coal had been dumped, it was moved to a transferring house (TH-1) that was at a pivot of the plant's coal handling system (see Figure 1). The TH-1 was connected with the dump house, the coal storage piles and the plant through conveyor belts. From TH-1, the coal could be fed directly into the plant or sent to two storage piles: an active reclaim pile and an emergency stockpile. When needed, coal could be retrieved from the active reclaim pile by a coal reclaimer and transported to the plant to feed the boilers. There was approximately a two to three week supply of coal stored in the active reclaim pile. The emergency stockpile was needed only when the coal reclaimer broke or the active reclaim pile was depleted - typically once or twice a month in winter and seldom in summer.

The Material Handling Team consisted of 12 "A" operators (including the victim), two "B" operators, three maintenance workers and a team leader. An "A" operator was qualified to operate both stationary and mobile equipment including bulldozers, dump trucks, and front-end loaders. A "B" operator could only operate stationary equipment, such as the coal dumping equipment, coal reclaimer, the coal cracker, and the conveyor belts.

The coal transporting system between the emergency stockpile and TH-1 consisted of a ground opening that was covered by a 14' X 14' steel grid ("grizzly"), an initial hopper, a frozen coal cracker, a second hopper, and a conveyor that was partially underground. The initial step in the coal transport involved a bulldozer and a front-end loader that were used to push coal over the grizzly that had 12" by 12" grid openings for the coal to fall through (see Figure 2). Coal would then pass through the first hopper and into a coal cracker that was located 15 feet below ground level. The coal cracker, driven by a 150 HP electrical motor, had a steel drum with teeth that rotated against a steel plate to crush frozen coal (see Figure 3). The clearance between the steel teeth and the plate was approximately 7". The coal cracker was capable of crushing 1,500 tons of coal in an hour. Coal then passed through a second hopper which was underneath the coal cracker and was 12 feet deep. A conveyor then transported the coal to TH-1 and on to the plant at a speed of 650 feet per minute (ft/min).

The plant's Material Handling Training Manual did not have specific provisions on safety procedures for a worker to follow if the worker had to walk on a grizzly during emergency situations. According to plant management, workers were trained not to walk on a grizzly.

The last time the emergency stockpile had been used before the fatal incident was on January 22nd. On that day, damage to the grizzly was recorded in the team's daily log. The steel bars (1"X10") that formed the grids were broken and bent in one corner of the grizzly, resulting in a 2' by 2.5' hole. The team leader and the maintenance crew assessed the damage and decided to delay repairing the grizzly until spring, when the weather became warmer. According to the union steward, the majority of the team, including the victim, was verbally informed of the damage and the decision to delay the repair job.

On the morning of February 11<sup>th</sup>, the day of the incident, the active reclaiming system was malfunctioning and coal had to be reclaimed from the emergency stockpile. The mean temperature on the day of the incident was 7.7°F with a low of -5.8°F. Due to the prolonged period of cold and heavy snow, coal was frozen on the grizzly. At approximately 9:00 AM, the victim and a co-worker had a discussion about how to proceed with the job, and decided to use a front-end loader to break up the frozen coal and a bulldozer to push the coal over the grizzly. At this point, the coal cracker had already been started and the hoppers were empty. The co-worker went to get the front-end loader at the other side of TH-1. The victim was supposed to get the bulldozer located about 100 feet to the east of the grizzly. Just prior to the incident, the TH-1 operator and a plant engineer saw from the TH-1 window that the victim was walking on the grizzly holding a shovel. It appeared that the victim was using the shovel to break up the frozen coal and clear the clogged grids. At 9:18 AM, the engineer noticed that the shovel was left on the grizzly but the victim was gone. Neither the operator nor the engineer saw the victim fall. The engineer immediately told the TH-1 operator to shut down the coal transporting system. The victim was found on the conveyor belt 50 feet away from the grizzly. He had apparently fallen through the hole on the grizzly into the hoppers and the coal cracker and was carried out by the conveyor belt. The TH-1 operator immediately called a control operator, who was the incident commander, in the plant master control room. The incident commander summoned an ambulance that arrived at the site in ten minutes. The victim was transported to a local hospital where he was pronounced dead around 10:00 AM. The company replaced the broken grizzly with a new one after the fatal incident.

## **CAUSE OF DEATH**

The cause of death was listed on the death certificate as crushing injuries to torso.

## **RECOMMENDATIONS/DISCUSSION**

**Recommendation #1:** *Employers should repair damaged equipment in a timely manner, and place warning signs and guards immediately on and around the damaged equipment to warn workers of the safety hazard.*

**Discussion:** In the event a piece of equipment becomes damaged or malfunctions, the equipment should be removed from service and repairs should be done immediately if the damaged equipment presents a safety hazard to the operator or other employees who work in the same area. If the damaged equipment cannot be removed from service or the repairs cannot be done immediately,

guardrails should be placed around the equipment, covers over fall hazards, and warning signs posted to warn workers of the safety hazards.

**Recommendation #2:** *Employers should develop standard procedures for emergency situations in which employees may have to walk on a grizzly and mandate the use of personal fall arrest systems.*

**Discussion:** A worker is potentially exposed to a number of hazards when the worker walks and performs tasks on a grizzly: coal piles may collapse and bury the worker or the worker may slip and fall as in this incident. The company should develop standard procedures for emergency situations during which workers have to walk on a grizzly as in this incident. Workers should be required to use a personal fall arrest systems which may consist of anchorage (a secure point of attachment), connectors, a body belt or harness, a lanyard, deceleration device, and lifeline if they are to walk on a grizzly. This requirement should be included in the plant's Material Handling Training Manual, and workers and team leaders should receive immediate training. Annual refresher training should be provided. The employer should increase supervision to ensure that workers strictly follow the company's requirement. Both periodic scheduled and random non-scheduled inspections should be conducted. The results of each inspection should be documented and shared with managers and workers to raise the awareness and alertness levels.

**Recommendation #3:** *Employers should evaluate the effectiveness of current plant occupational safety and health management structures, and establish a system that anticipates likely problems and hazards, and assigns clearly defined responsibilities and accountability.*

**Discussion:** The current plant safety and health programs were managed and maintained through a loosely structured Safety Steering Committee with members sharing safety responsibilities that were not clearly defined. An effective safety and health program cannot be implemented and maintained without clearly defined responsibilities and accountability. The company should establish a safety and health management system that has experienced full-time safety and health professionals who have the knowledge to recognize, evaluate and control specific occupational hazards associated with power plant operations. An effective reporting system for identified hazards should be set up. The chain-of-command should be clearly defined in the company's organizational chart. Each member of the safety and health team should have specific responsibilities. Additionally, a tracking system should be set up to ensure that each member is accountable for his or her designated duties.

**Keywords:** *fall, power plant, coal cracker, machinery*

The Fatality Assessment and Control (FACE) program is one of many workplace health and safety programs administered by the New York State Department of Health (NYS DOH). It is a research program designed to identify and study fatal occupational injuries. Under a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), the NYS DOH FACE program collects information on occupational fatalities in New York State (excluding New York City) and targets specific types of fatalities for evaluation. NYS FACE investigators evaluate information from multiple sources. Findings are summarized in narrative reports that include recommendations for preventing similar events in the future. These recommendations are distributed to employers, workers, and other organizations interested in promoting workplace safety. The FACE program does not determine fault or legal liability associated with a fatal incident. Names of employers, victims and/or witnesses are not included in written investigative reports or other databases to protect the confidentiality of those who voluntarily participate in the program.

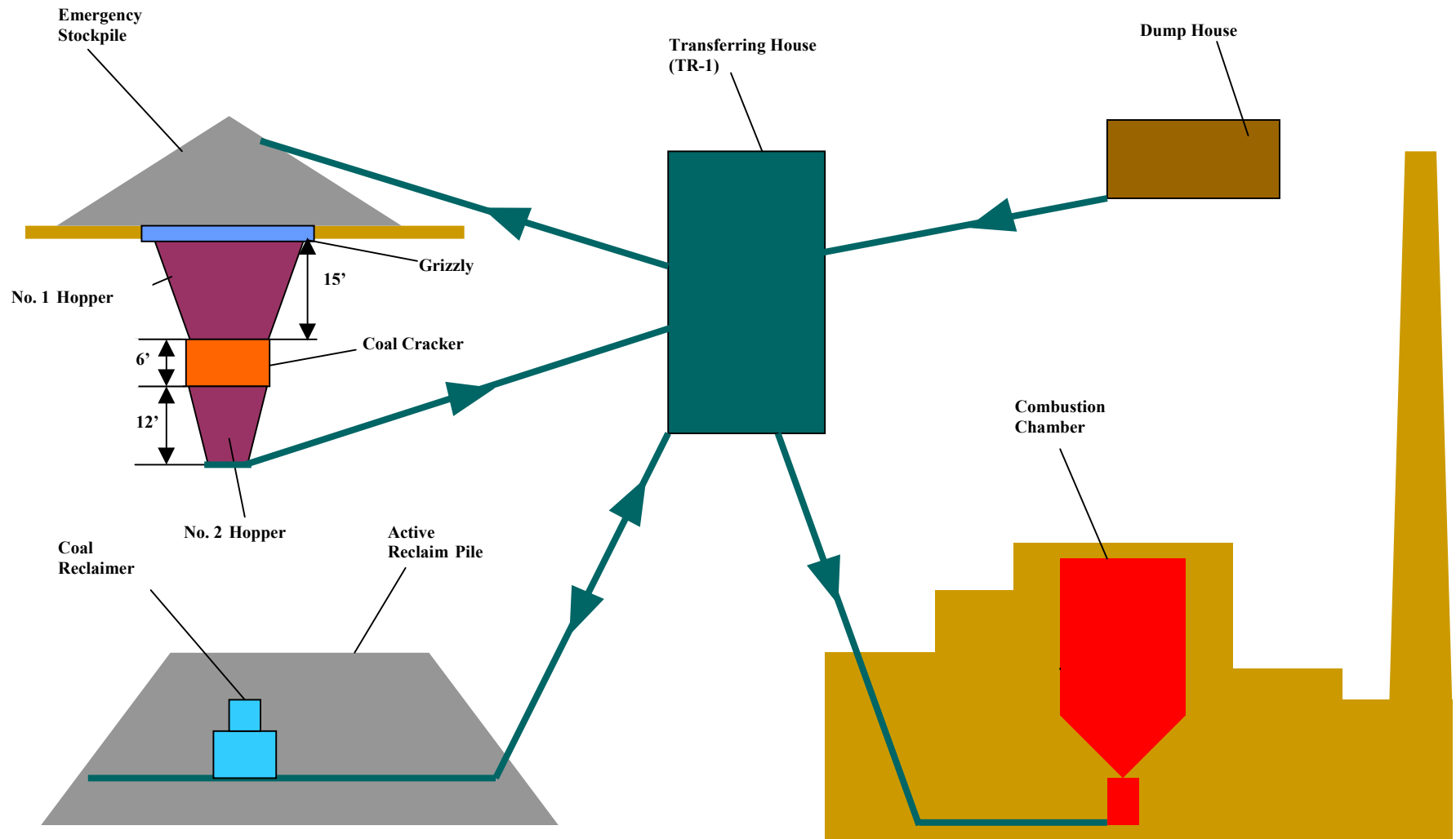
Additional information regarding the New York State FACE program can be obtained from:

New York State Department of Health FACE Program  
Bureau of Occupational Health  
Flanigan Square, Room 230  
547 River Street  
Troy, NY 12180

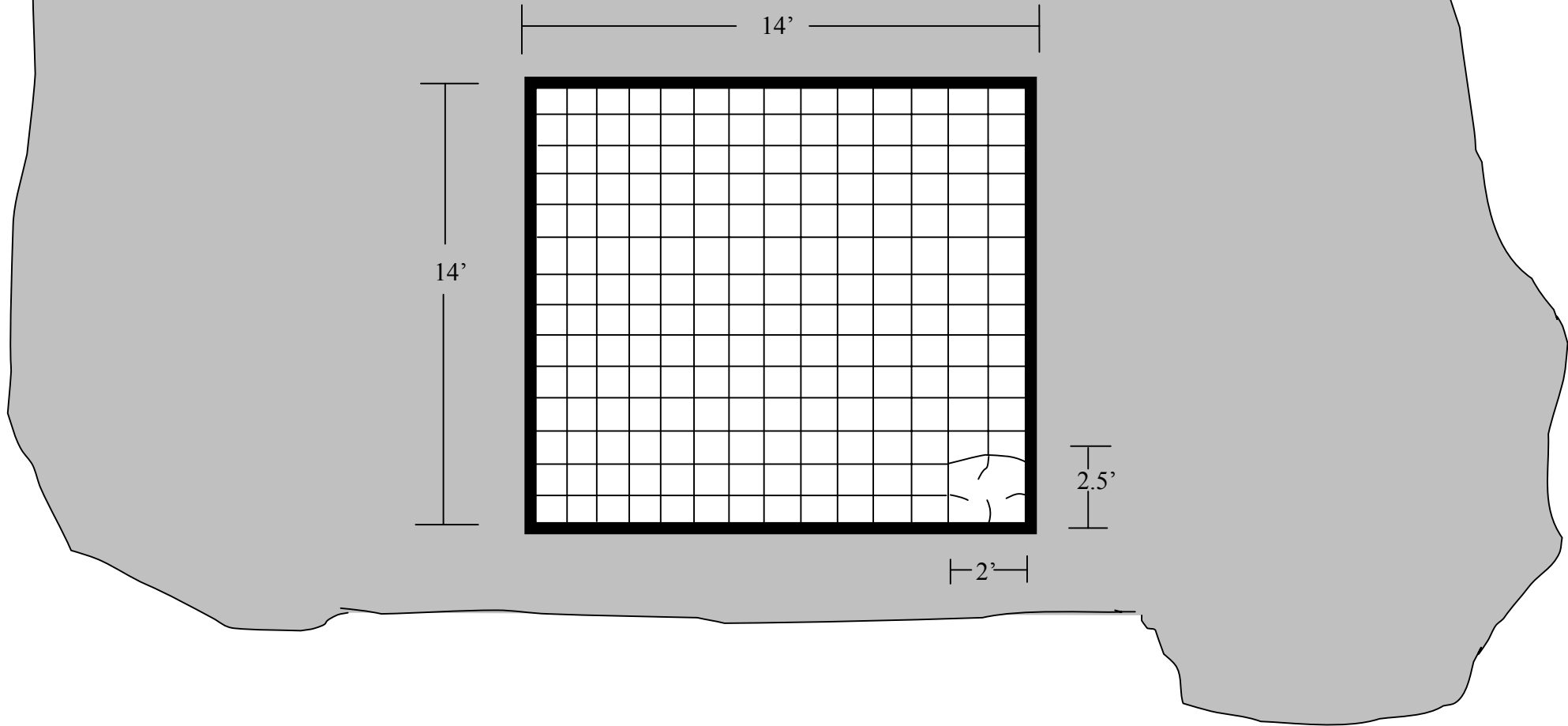
1-866-807-2130

[www.health.state.ny.us/nysdoh/face/face.htm](http://www.health.state.ny.us/nysdoh/face/face.htm)

Figure 1. Illustration of the coal handling system in the coal-fired generating plant (The arrows demonstrate the coal moving directions).



**Emergency Stockpile**



**Figure 2. Overhead view of grizzly. (Drawing not to scale).**



Figure 3. Coal Cracker

