

TO: Director, National Institute for Occupational Safety and Health
FROM: California Fatality Assessment and Control Evaluation (FACE) Program
SUBJECT: Recycling Packer Dies After Being Crushed by a Recycling Ram in California

SUMMARY

California FACE Report #95CA006

A 26 year old, white, male recycling packer (the victim) died after being crushed in a paper recycling bin by a recycling ram (crushing device) that exerts 118 tons of force. The interior dimensions of the bin were 70½" high x 96" long x 48" wide. There were no witnesses to the incident and it is unknown why the victim was inside the recycling bin or how the ram was started. Approximately 15 minutes before the incident, the victim and a co-worker had been loading cardboard into the bin with a front end loader, working in a team according to company policy. The victim's co-worker left the area for several minutes to assist another worker and when he returned, he discovered the victim crushed inside the bin. He immediately deactivated the ram by hitting the emergency shutoff button. The ram then returned to its fully retracted position. A second worker climbed into the bin and the victim asked him for help. Paramedics were summoned to the scene at 12:02 p.m. and found the victim alert and disoriented. He was transported to the hospital and suffered full arrest two minutes after leaving the site. He was pronounced dead at 12:27 p.m.

On occasion, pieces of cardboard or other material would become lodged in the bin and it was standard practice to remove obstacles with a front end loader. It was not positively known whether the victim was in the bin trying to manually dislodge or retrieve material, but this is a possibility. The company had no effective lockout/tagout procedures and the main power source for the recycling bin was located in an area that was difficult to access. The CA/FACE investigator concluded that in order to prevent similar future occurrences, employers should:

- develop and implement a lockout/tagout procedure for all employees who operate or maintain any type of industrial machinery.
- assure that compactors are guarded by covers, deadman controls, or by any other means that prevent workers from coming into contact with an operating ram or that prevents the ram from operating whenever a worker enters the travel zone of the ram.
- develop, implement, and enforce a comprehensive, written Injury and Illness Prevention Program (IIPP) that includes, but is not limited to, training in proper procedures for all employees who operate or maintain industrial machinery.
- conduct periodic work-site surveys to assess the setting for potential safety hazards and institute corrective actions when hazards are identified.
- train all workers in safe emergency rescue procedures that do not put rescuers at risk of injury.

INTRODUCTION

On March 18, 1995, a 26 year old recycling packer (the victim) died after being crushed by a recycling ram at a paper and aluminum recycling facility. The CA/FACE investigator was informed of this incident by a Cal/OSHA safety engineer. A joint site investigation was conducted with Cal/OSHA on April 7, 1995. The site investigation included interviewing the company owner and several co-workers and taking photographs of the incident site. A copy of the Cal/OSHA, police, paramedic, and coroner's autopsy reports were obtained by the CA/FACE investigator.

The employer in this incident was a recycling facility which collected and baled cardboard paper and aluminum cans. There were 24 workers employed by the company; seven were at the site on the day of the incident. The company did not have any written safety rules but the employer stated that workers received on-the-job training. A supervisor was required to work with new employees for a period of four hours and to periodically monitor their work for one week after hire. There were no regular safety meetings or ongoing training for established employees.

The employer was the designated safety officer and he devoted less than 25% of his time to safety issues. He was not at the site at the time of the incident. The victim had worked for his employer for two years and the company had been at this site since 1984. The employer stated that the victim was experienced in the basic operations of the plant which included activating and deactivating the ram, loading the baler with cardboard using a front end loader, and using a pneumatic tool to tie the compacted bales with wire.

INVESTIGATION

On the day of the incident, the victim and his co-worker had been at work loading cardboard into the recycling bin. The operation was performed outside, adjacent to the back wall of a corrugated metal shed. The weather was clear. The recycling baler, manufactured in 1986, consists of a cylinder which provides power to the ram, a baler chamber, a compacting and wrapping bin, and an exit chute (**Please see Exhibit 1 and Exhibit 2**). The baler chamber is 96" long and 48" wide. The front wall of the baler chamber is 70½" high and the back wall and two side walls are 150½" tall. There is a small window on one of the side walls through which workers can look into the bin to inspect its contents. It is accessed by climbing onto a small platform.

Cardboard is loaded into the baler chamber using a front end loader. The ram is then started. The operator has the choice of allowing the ram to move across the length of the bin and stop in the fully extended position or can set the machine in an automatic mode. In the automatic mode, the ram will travel across the bin and return to the fully retracted position. Excess material above the ram is automatically cut by a "V" shaped blade which is mounted on the side of the bin. If the ram encounters 118 tons of resistance, the ram will remain in the fully extended position allowing the compressed cardboard to be tied. The bales are tied in the compacting/wrapping bin with steel wire. After a bale is tied, it is pushed out of the wrapping chamber onto the outlet chute by the next bale. Bales are moved from the outlet chute using a forklift.

The control panel for the ram is located approximately five feet from the baler chamber on the back side of the ram cage. Access to the control panel required that employees bend over or get down on one knee in order to reach the controls. It is not accessible from inside the bin.

The control panel had seven color-coded operational buttons of which only four were clearly marked. The panel did not have a key switch and wires were exposed through slots where additional buttons could have been positioned (**Please see Exhibit 2**). The equipment is activated by pushing a red start button. The emergency shutoff switch was located adjacent to the start button and next to a lever switch which allowed the ram to be operated in either the manual or automatic mode. The location of the panel was such that employees at the control panel were unable to monitor the activity in the bin before pushing the control buttons or while the ram was in operation.

The main power source for the baler was located along a back wall in the adjacent metal shed. In order for the baler to be completely de-energized, this switch has to be turned off. In order to reach this power box, a worker has to walk away from the baler, around the corner of the shed, and through a door in the shed, past various obstacles. Access to the panel was blocked by haphazardly stored materials.

Company policy required that all employees work in pairs when loading cardboard into the baler chamber. The victim and his co-worker adhered to the policy. In this situation, the victim had been stationed at the control panel and also was using a hose to wet the cardboard. His co-worker had been responsible for dumping the cardboard into the baling chamber with a front end loader. Shortly before noon, the co-worker left the area to assist a mechanic in a different area of the facility. He last saw the victim standing beside the recycling bin. He returned less than ten minutes later and saw the victim inside the baler chamber with his hands shaking above his head. The ram was in the fully extended compacting position. The co-worker ran to the control panel, hit the emergency shutoff button, deactivating the ram and allowing the ram to fully retract. He also summoned emergency services. At this time, a full lockout was not performed and the machine was not de-energized. A second co-worker, the mechanic, arrived on the scene, climbed into the baler, and asked the victim what had happened. The victim was only able to ask him for help. The paramedics arrived at 12:06 p.m. within four minutes of the call and found the victim alert but disoriented. He was transported to the hospital and suffered full arrest at 12:18 p.m. He was pronounced dead at the hospital at 12:27 p.m.

The victim's employer stated that there was no reason for the victim to be inside the bin and that he had never been given permission to enter the bin. He also stated that it was standard practice to remove lodged material with a front end loader. The employer and co-workers examined the baler chamber after the incident and found no evidence that a jam had occurred. It is possible that the victim entered the bin to dislodge materials or to retrieve material. Fatalities with both stationary and mobile compacting equipment have occurred under such circumstances.

The employer stated that no malfunction had ever occurred with this machine. Maintenance was performed approximately twice a year by an outside contractor on a Sunday when no other work was being performed. Maintenance work usually consisted of replacing the floor in the bin. Numerous tests were conducted on the recycling equipment by staff of the District Attorney's Office and Cal/OSHA. No mechanical or electrical problems were detected during those tests.

CAUSE OF DEATH

The Coroner's Autopsy Report stated the cause of death as multiple crush injuries.

RECOMMENDATIONS

Recommendation #1: Employers should develop and implement lockout/tagout policies and procedures for all employees who operate or maintain any type of machinery.

Discussion: In this incident there were no lockout/tagout procedures in effect. There was no key switch on the panel, nor any evidence of tags or padlocks. A comprehensive lockout/tagout procedure should include the following steps:

1. Notify all affected employees that a lockout is required and why is it necessary.
2. Identify the type and magnitude of the energy the machine used and how to control it.
3. Shut down the machine to be serviced by normal means (depress stop button, open toggle switch, close valve etc.)
4. Operate the switch, valve, or other energy isolating devices so that the energy sources(s) (electrical, mechanical, hydraulic, other) is disconnected or isolated from the equipment.
5. Dissipate or restrain stored or residual energy by methods such as grounding, blocking, or bleeding etc.
6. Lock out energy isolating devices with an assigned individual lock.
7. After assuring that no personnel are exposed and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate. Be sure to return the operating controls to their neutral position.
8. The equipment is now locked out.

To restore equipment to service, the following steps must be followed:

1. When the job is complete and equipment is ready for testing or normal service, check the equipment area to see that no one is exposed.
2. When equipment is clear, remove all locks. The energy isolating devices may be operated to restore energy to equipment.

Under Title 8 of the California Code of Regulations (CCRs), section 4413, De-energizing and Lockout, machines shall be locked out in accordance with 3314 during set-up, repair, clean-up and maintenance procedures. In this situation there was no lockout/tagout at the control panel and the closest power source for de-energizing the equipment was difficult to reach. If a full lockout/tagout program had been initiated, including employee training, and with physical lockout at the control panel, this incident may have been avoided.

Recommendation #2: Employers should assure that compactors are guarded by covers, deadman controls, or by any other means that prevent workers from coming into contact with an operating ram or that prevents the ram from operating whenever a worker enters the travel zone of the ram.

Discussion: In this incident, it is unknown why the victim entered the recycling bin. Although the employer stated that no worker had ever been given permission to enter the bin during its

usual operations, it is reasonable to assume that on rare occasions a worker might enter the bin. No effective barriers to entry or ram activation existed at this site. If an enclosed conveyor system had been in place to transport materials into the compacting bin, the physical configuration of such a system would not have allowed an employee to enter the bin. An interlock that prevents travel of the ram unless the system remains enclosed would also have been helpful.

Recommendation #3: Employers should develop, implement, and enforce a comprehensive, written Injury and Illness Prevention Program (IIPP) that includes, but is not limited to, training in proper education for all employees who operate or maintain industrial machinery.

Discussion: In this incident, the employer did have an on-the-job safety training program for new hires which covered basic machine operation. There was, however, no training in lockout/tagout procedures or regular safety meetings or periodic training sessions for established employees. There was no written safety program or written documentation of safety training. The existing training program was rather limited given the nature of the operation and the type of machinery used. An ongoing training program with safety meetings would have offered established employees the opportunity to discuss job hazards and newly identified potential problems. Under Title 8 of the CCRs section 3203 (a), employers must include a system for ensuring that employees understand safe and healthy work practices and comply with them.

Recommendation #4: Employers should conduct periodic work-site surveys to assess the setting for potential safety hazards and institute corrective actions when hazards are identified.

Discussion: At this worksite, the physical configuration of the recycling bin and its component parts placed workers at high risk for injury. Examples of job hazards identified during this investigation are 1) poor placement of the control panel and the main power switch; 2) easy access to the point of operation; and 3) exposed wiring on the control panel. A walk-through conducted by a safety professional familiar with the company's processes, operations, and equipment should be conducted on a regular basis. Employees should also participate in the evaluation. Employee participation ensures that work habits are assessed along with the environment and could alert employers to unsafe procedures being used. Joint participation also fosters greater safety knowledge and awareness as well as demonstrating the employer's commitment to safety.

Recommendation #5: Employers should train all workers in safe emergency rescue procedures that do not put them at risk of injury.

Discussion: In this incident, one of the victim's co-workers climbed into the bin to assist the victim. Although the ram had been fully retracted through use of the emergency shut-off button, no lockout had been performed and the machine was not de-energized. This potentially could have allowed the ram to crush the rescuer. Employers should develop written rescue procedures and periodically review them with all employees to insure that they do not put themselves at risk of injury during rescue procedures.

References:

New Jersey FACE Investigation Report, No. 93NJ04001, New Jersey Department of Health, Trenton, NJ

Colorado FACE Investigation Report, No. 94CO029, Colorado Department of Health, Denver, CO.

State of California, Department of Industrial Relations, Division of Occupational Safety and Health, Lockout/Blockout. Number S-515, May, 1995.

Barclays Official California Code of Regulations, Vol. 9, Title 8, Industrial Relations. South San Francisco, 1990.

John Fowler
FACE Investigator

Robert Harrison, MD, MPH
FACE Project Officer

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Marion Gillen, RN, MPH
Research Scientist

FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal by studying the work environment, the

worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. NIOSH-funded, state-based FACE programs include: Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin.

Additional information regarding the CA/FACE program is available from:

**California FACE Program
California Department of Health Services
Occupational Health Branch
850 Marina Bay Parkway, Building P, 3rd Floor
Richmond, CA 94804**