

TO: Director, National Institute for Occupational Safety and Health

FROM: California Fatality Assessment and Control Evaluation (FACE) Program

SUBJECT: Sheet Operator Dies after Being Crushed by the Forks on a Sheeting Unit in California

SUMMARY
California FACE Report #95CA012

A 26-year-old male sheet operator (the victim) died after being struck in the head with the loading arms (receiving forks) of a sheeter unit. This machine cuts and stacks cardboard in a folding carton operation. The victim was adjusting the belts on the underside of the conveyor section of the unit when his co-worker, an apprentice, pushed the deadman switch to retract the receiving forks of the sheeter. He retracted the forks, according to standard operation procedures (SOP), to allow the cardboard resting on the forks to drop onto a pallet below. As the unguarded forks retracted they struck the victim on the back left side of his head and knocked him to the floor. Although the apprentice and victim were in close proximity to each other (within 5 feet), the apprentice was unaware of the victim's location because the control panel of the machine was obstructing his view. The apprentice heard a loud noise, observed the victim lying on the floor, and immediately turned off the power and summoned help. Paramedics were called to the scene and pronounced the victim dead. The CA/FACE investigator concluded that in order to prevent similar future occurrences, employers should:

- guard all moveable parts of machinery with a wire screen or by other means to prevent employees from becoming exposed to moveable parts or other types of mechanical motion.
- insure that adjustments of moving machinery can be made in a safe manner.
- have a standard operating procedure (SOP) specifying that all employees must be in clear view of the machine operator or that there is positive communication between all workers.

In addition, product manufacturers and designers should:

- assure that all components of machines be installed in such a way that they do not obstruct operator view or otherwise put workers at risk. In addition, highly automated machines should be designed with no unguarded moving parts.

INTRODUCTION

On July 26, 1995, a 26-year-old sheeter operator (the victim) died after being struck in the head by the receiving forks of a sheeter unit that were being retracted. The CA/FACE investigator was informed of this incident by a California Division of Occupational Safety & Health (Cal/OSHA) district office on July 28, 1995. An employer interview and a site visit were conducted by the CA/FACE investigator on August 7, 1995. A second site visit, which included employer interviews and taking photographs of the machinery, was conducted by the CA/FACE investigator, a research scientist with the CA/FACE program, and an official from the National Institute for Occupational Safety & Health (NIOSH), on August 24, 1995. Copies of the police, Cal/OSHA, and coroner's autopsy reports were obtained by the CA/FACE investigator.

The employer in this incident was a manufacturer of folding cardboard cartons. There were two different operations being performed in this clean, well-kept facility, which occupied 180 to 190 thousand square feet. The operation where the incident occurred produced folding cartons and the second operation produced corrugated cartons. The company employed 175 workers, approximately 40 of whom worked in the folding carton division. At the time of the incident, there were approximately 20 employees working on the first of two 10-hour shifts. The company employed a safety officer who devoted approximately 50% of his time to safety issues.

All provisions for safety program compliance under Title 8 of the California Code of Regulations (CCRs), were present except section 3203 (a)(2). This section states that the employer should include a system for ensuring that employees comply with safe and healthy work practices. The employer stated that the victim was an experienced sheet operator and had worked for the company for approximately two and a half years. He had received training as an apprentice for one year before he was promoted to his position as a sheet operator. The victim was training an apprentice in the operation of the sheeter unit at the time of the incident. He and his co-worker were wearing ear plugs and eye protection. No other personal protective equipment was required for the job the workers were performing.

INVESTIGATION

At approximately 7:56 a.m. on the day of the incident, the victim and his co-worker (apprentice) were at work on a sheeter unit. This automated machine, designed for high speed continuous operation, cuts cardboard into required proportions and stacks it either on receiving forks or a wooden pallet. The machine occupies 481 square feet and has four general components: a feeder, cutter, conveyor belt, and stacker. The cutter and conveyor belt section are elevated and there is an area under the conveyor section which was used to access the belt when making adjustments. Cardboard rolls are loaded onto one end of the unit with the aid of a flat forklift. The cardboard then proceeds along rollers where it is straightened and cut into specific lengths and widths (cutting section). It then moves onto the conveyor belt, and finally to the counter ejector system where the cardboard is counted and stacked. The maximum amount of sheets counted and stacked is 800 sheets per minute. The cardboard is then processed into custom designed boxes and shipped to customers.

Both the victim and the apprentice were wearing earplugs according to company policy. The victim was adjusting the belts/crimpers from the underside of the conveyor belt while the

machine was operating. The apprentice was standing at the control panel near the end of the unit where the cardboard is stacked, approximately 5 feet from the victim. At that location the cardboard comes off the sheeter unit and is stacked onto a pallet. When the load on the pallet reaches a pre-determined height, the load forks on the sheeter extend out and catch the cardboard until the full pallet is removed and a new pallet can be put into place. When the empty pallet is in position under the forks, the forks are retracted and the stack of cardboard falls onto the new pallet. These procedures are performed in accordance with the standard operating procedures (SOP) of the employer and the manufacturer's manual.

At the time of the incident, the apprentice was unaware that the victim was located in the access area underneath the conveyor belt because the position of the control panel partially obstructed his view of the conveyor belt area. The victim was standing approximately five feet from him and was adjusting the belts. The access area was approximately 57 inches in height from the floor to the area under the conveyor where the adjustments were being made.

When the stack of cardboard required a new pallet, the apprentice retracted the forks with a deadman switch which required that his hand be on the switch during the entire process. The victim had his back to the forks, so that when they were retracted, they struck him in the rear left side of his head and knocked him to the floor. The apprentice saw the victim lying on the ground, immediately turned off the sheeter, and summoned help. Co-workers initiated cardiopulmonary resuscitation (CPR) with the help of a police department deputy. Paramedics arrived within several minutes and the victim was pronounced dead at 8:06 a.m. The employer initiated a counseling program within a few days of the incident for all staff at the facility.

CAUSE OF DEATH

The Coroner's Autopsy Report stated the cause of death to be craniocerebral trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should guard all moveable parts of machinery with a wire screen or by other means to prevent employees from becoming exposed to moveable parts or other types of mechanical motion.

Discussion: The sheeter unit, though recently manufactured, did not adequately guard the receiving forks, because adjustments were made to the belts/ crimpers in the same area where the forks were retracted. After this incident, the manufacturer and the employer devised a guard to protect employees from the unguarded moveable part on the sheeter unit. This guard (a wire screen) was installed horizontally below the receiving forks. Since access to the crimpers on the underside of the conveyor belt is now blocked by the wire screen, all adjustments must now be made on the upper side of the belt. This design substantially reduces the risk for any employee to be struck by moving parts.

Recommendation #2: Employers should insure that adjustments of moving machinery can be made by employees in a safe manner.

Discussion: The design of this sheeter unit required that adjustments be made while the machine was running. The victim was making adjustments to the belts on the underside of the sheeter unit with exposure to the moving receiving forks. Under Title 8 of the CCRs, Cleaning, Repairing, Servicing and Adjusting Prime Movers, Machinery and Equipment, Section 3314 (a): "Machinery or equipment capable of movement shall be stopped and the power source de-energized or disengaged, and, if necessary, the moveable parts shall be mechanically blocked or locked out to prevent inadvertent movement during cleaning, servicing or adjusting operations unless the machinery or equipment must be capable of movement during this period in order to perform the specific task. If so, the employer shall minimize the hazard of movement by providing and requiring the use of extension tools (e.g., extended swabs, brushes, scrapers) or other methods or means to protect employees from injury due to such movement. Employees shall be made familiar with the safe use and maintenance of such tools by thorough training." Subsequent to this incident, the sheeter unit has been modified to allow adjustments to be made from the top of the unit after the machine has been turned off. Further modifications are being devised which will allow workers to adjust the crimpers while the machine is operating.

Recommendation #3: Employers should have a standard operating procedure (SOP) specifying that all employees must be in clear view of the machine operator or that there is positive communication between all workers.

Discussion: In this incident, the apprentice did not know where the victim was at the time he retracted the forks on the sheeter unit. The control panel partially obstructed his view of the area where the victim had been working. Because of the noise level in the work area, hearing protection was necessary and its use restricted verbal communication between workers. This incident may have been prevented if a standard operating procedure (SOP) had been developed prior to the incident stating that before any operations are conducted the operator must be aware of the location of co-workers. Under Title 8 of the CCRs, Section 3314, (e): "On repetitive process machines, such as numerical control machines, which require power or current continuance to maintain indexing and where repair, adjustment, testing, or setting up operations cannot be accomplished with the prime mover or energy source disconnected, such operations may be performed under the following conditions:... (2) All participants must be in clear view of the operator or in positive communication with each other."

Recommendation #4: Product manufacturers and designers should assure that all components of machines, such as control panels, be installed in such a way that they do not obstruct operator view or otherwise put workers at risk. In addition, newly designed, highly automated machines should be constructed with no unguarded moving parts.

Discussion: Except during routine maintenance, this sheeter had been in continuous operation since 1992. No injuries had been associated with this unit. It was highly unlikely that the retracting forks, located on the underside of the conveyor belt, and capable of only moving 39 inches, could have caused a fatality. Nonetheless, the potential for injury existed since the forks were not guarded, the access space was large enough for an operator to enter (57 inches in height), and the location of the control panel created a blind spot for the operator. Safety should be engineered into the design and layout of the machine (and its process) so that workers will be protected from harm during any phase of operation or maintenance.

References

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

John Fowler
FACE Investigator

Robert Harrison, MD, MPH
FACE Project Officer

Marion Gillen, RN, MPH
Research Scientist

August 26, 1996

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**