TO: Director, National Institute for Occupational Safety and Health

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

SUBJECT: Industrial machinery mover dies when a heavy cabinet falls off of transport devices and crushes him in California

SUMMARY
California FACE Report 98CA008

A 45-year old industrial machinery mover(decedent) died when he was crushed between a heavy cabinet and a concrete wall. The decedent was behind the cabinet which was being moved into place by a system of rollers (skates) and lumber. The cabinet was "top heavy" and it tipped toward the wall pinning the decedent against the wall. A 4X4 had been placed on top of each of the two skates which had been placed under the cabinet. The two skates, which were not as long as the cabinet was deep, had been placed in the center of the depth of the cabinet. This placement caused the cabinet to be unstable. The CA/FACE investigator determined that, in order to prevent future occurrences, employers should:

- ensure employees do not place themselves in an area of danger where they may be crushed by heavy equipment or materials.
- ensure employees maintain the center of gravity within a proper base of support when moving heavy equipment.

INTRODUCTION

On June 27, 1998, at 9:07 a.m., a 45-year old male industrial machinery mover was fatally injured when he was crushed by a heavy cabinet that fell when it was being moved into position. The cabinet tipped off of the moving devices (skates) and the decedent was pinned between a concrete wall and the cabinet. The CA/FACE investigator learned of this incident on June 30, 1998 from the local legal office of the California Occupational Safety & Health Administration (Cal/OSHA). On July 2, 1998, the CA/FACE investigator traveled to the incident site where he met with a representative of Cal/OSHA. The CA/FACE investigator spoke to three workers of the electrical contractor who were on site at the time of the incident and took photographs of the area where the incident happened. The CA/FACE investigator visited the employer's main facility on July 29, 1998, interviewed one of the owners and took additional photographs of the equipment involved.

The employer, an industrial machinery mover, had been in business for approximately 23 years and 4 months at the time of the incident. The company had 35 employees with 2 working on site at the time of the incident. The decedent had worked for the company for 9 years, and

had worked at the site of the incident for one day.

Company safety responsibilities were defined, with the overall safety responsibility assigned to the company owners and site foremen having responsibility at the various sites. The company had an Injury and Illness Prevention Program (IIPP) which contained all of the required elements and a code of safe practices. The decedent was trained in the hazards of the industrial machinery moving through on-the-job training during his initial one and one-half years with the company. Progressive on-the-job training continued as the decedent was involved, under supervision, with different moving tasks. The employer stated that there were no specific, written instructions for the duties of an industrial machinery mover since every job is unique. Safety meetings were conducted every third Tuesday and before each job.

INVESTIGATION

The site of the incident is a small, triangular-shaped electrical room located in the bottom floor of a large commercial office building. Many cabinets, electrical conduits and wiring were being installed in the room. The room was not accessible by forklift because of a restricted 3-foot wide doorway. The room itself was cramped for moving large cabinets.

The electricians working on the job had moved some of the cabinets into the electrical room, but did not want to undertake moving them into the final position. They called the employer involved in this incident to move the cabinets into their final position in the electrical room.

The employer determined what equipment they would need by the description given over the phone. The necessary equipment determined the day before the job was obtained and transported to the job site by the decedent and his co-worker. When the employees arrived at the site, they sized up the job. The decedent, the acting foreman at the site, and his co-worker decided to transport the heavy cabinets with rolling devices called "skates." The skates were steel platforms with three axles under each platform. The skate platform was 5 inches wide and 10 inches long (**exhibits 1 and 2**). Each axle had a steel wheel on each end. The wheels were 2 1/2 inches in diameter. The wheelbase of the skates, front axle to rear axle, was 5 7/8 inches. The distance between the outside of the wheels was 9 5/8 inches.

The cabinet involved in this incident weighed approximately 5,000 pounds. It was 33 inches in depth, 42 1/2 inches wide and 75 inches tall (**exhibit 3**). Two channels in which forklift prongs fit were attached to the bottom of the cabinet, running the full 33-inch depth. Each channel was 8 1/2 inches wide. The outside edge of the right hand channel was 7 1/4 inches from the right edge. The outside edge of the left hand channel was 2 1/2 inches from the left edge. The cabinet contained a number of batteries (**exhibit 4**) and since the batteries were off center to the left, the channels were similarly placed off center**.** The cabinet had warning decals posted indicating that it was "top heavy" (**exhibit 5**). The warning decals also indicated that the cabinet should not be tipped beyond 15 degrees from vertical.

The final task, once the cabinets were inside the electrical room, was to place them on an isolation rack. The rack was a steel frame structure made to hold the cabinets five inches off the floor (**exhibits 4 and 5**). The procedure used by the employees was to align the cabinet with the isolation rack so it could be pushed straight back and onto the rack.

To accomplish the final task, the cabinet involved in this incident was jacked up with mechanical rachet-type jacks gradually on each side until the skates with 23-inch 4X4s on top could be placed underneath. The skates with the 4X4s were placed underneath the channels used for lifting the cabinet with a forklift or similar device. Two skates were used, each being placed in the middle of the depth of the cabinet. This left an unsupported overhang of 13 9/16 inches in the front and rear of the skates since the wheelbase of the skates was 5 7/8 inches.

When the cabinet was fully positioned on the two skates, it began to be pushed toward the isolation rack. The decedent went behind the cabinet for an unknown reason. The co-worker stated that they were struggling with the cabinet. They had moved it so the rear edge was approximately one foot from the front edge of the isolation rack. Suddenly the cabinet tipped toward the isolation rack and wall. The cabinet tipped over with the top edge pinning the decedent against the concrete wall in the middle of his chest.

The electricians on the job heard the commotion and proceeded to the electrical room. They immediately helped the co-worker remove the cabinet from the decedent. They used metal unistrut bars (**exhibit 6**), used for hanging conduit on the wall, to pry the cabinet up and remove the skates and 4X4s from underneath. As they brought the cabinet back to an upright position, the decedent fell to the floor as no one was able to catch him.

A call was placed to emergency services and paramedics were dispatched. The paramedics transported the decedent to a local hospital where he was pronounced dead at 9:32 a.m.

CAUSE OF DEATH

The death certificate stated the cause of death to be blunt force injuries to the torso.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure employees do not place themselves in an area of danger where they may be crushed by heavy equipment or materials.

Discussion: In this incident, the decedent placed himself between the concrete wall and the cabinet being moved. It was uncertain why he placed himself in an area of danger. The cabinet was top heavy and unstable because of the placement of the moving devices. Not only was the center of gravity raised by placing the skates and 4X4s underneath, but their placement in the middle of the cabinet made it unstable and likely to tip. The skates could not swivel because of their design, so the cabinet could only be moved in a straight line toward the isolation rack and concrete wall. Therefore, because it was being pushed closer to the wall, the most likely direction that it would tip is toward the wall. If the employee had not placed himself in the area of danger between the moving cabinet and the wall, this incident most likely would not have happened.

Recommendation #2: Employers should ensure employees maintain the center of gravity within a proper base of support when moving heavy equipment.

Discussion: In this incident, the moving devices (skates and lumber) were placed in such a

manner that allowed the cabinet to become unstable. The cabinet was known to be top heavy from the decal warning labels affixed to the cabinet itself. Raising the cabinet off the floor would cause the center of gravity to also be raised. It had to be assured that the high center of gravity of the cabinet was placed properly between the supports which held it off the floor. The supports used in this incident were the two skates with a 4X4 placed on top of each. The cabinet was 33 inches deep and that depth was supported by the wheelbase of the skates--5 7/8 inches. Normally, one would expect such a cabinet raised in this manner to be supported by at least three points. A four-point support would be more likely to prevent tipping.

The skates were placed in the center of the depth of cabinet. Although placing the skates in center of the depth of the cabinet was appropriate, there was 13 9/16 inches in the front and the rear of the skates that would require support. The employees used dunnage, pieces of lumber, but they were located near the skates, not under the edges of the cabinet. The center of gravity may have been directly over the skates, but it was a precarious situation because there was little front to back support for the cabinet.

Employers can help ensure employees follow proper technique while moving heavy objects (maintaining centers of gravity over their base, e.g.) through a program of training and progressive disciplinary measures. A training/refresher program for this type of work could cover the mechanics and motion of objects with reinforcement through practical demonstrations. If additional support points had been used, whether by the use of additional skates or dunnage, this incident may not have happened.

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the California Public Health Foundation, and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations on 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, Maryland, Massachusetts, Maryland, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Washington, West Virginia, and Wisconsin.

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

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