

**MARYLAND DIVISION OF LABOR AND INDUSTRY
MARYLAND FACE PROGRAM
CASE: 96MD05501**

**TO: Project Officer, State FACE Project, Division of Safety Research,
NIOSH, CDC**

FROM: Maryland FACE Program, Division of Labor & Industry

SUBJECT: An elevator construction foreman was caught under an elevator car and died of injuries to the head and neck and compression asphyxia.

SUMMARY

On September 24, 1996, 53-year-old male elevator construction foreman (the victim) was killed and his helper, an elevator constructor (employed by another subcontractor) was injured, when the hydraulic elevator car they were working under fell on them. The two were adjusting the hydraulic cylinder when the car fell, trapping them in the elevator pit. Two wooden poles (4x4 by approximately twelve-feet long) used to keep the elevator from falling were placed leaning against the guide rails. The car was approximately fifteen inches above the poles, which they did not tie in place. The poles were knocked out of position when the car fell due to the sudden loss of hydraulic pressure and trapped the two workers under the car. The elevator apparently did not fall evenly to the bottom of the pit. This permitted the rescue team to enter the pit area and extract the injured. However, rescuers had to use air bags to help raise the car to remove the victim.

The MD/FACE Field Investigator concluded that to prevent similar future occurrences, employers should:

- ◆ *Train employees in the recognition of hazards, and methods to control hazards.*
- ◆ *Develop, set up and enforce comprehensive written instructions for making adjustments to hydraulic elevators.*

INTRODUCTION

On September 24, 1996, a 53-year-old male elevator construction foreman (the victim), employed by an elevator company, and an elevator constructor, employed by an elevator service company, were adjusting a hydraulic elevator at a multi million dollar new construction site. While adjusting the height of the hydraulic cylinder, the elevator fell on them. The MD/FACE

Field Investigator was notified of the incident Wednesday, September 25, 1996, by a MOSH Preliminary Report.

Information regarding the incident was gathered by the MD/FACE Field Investigator from on site interviews conducted Thursday, October 3, 1996. Present at the interviews were: the general contractor's safety director; the elevator company's vice president of administration (the victim's employer); the elevator service company's president (the injured's employer); and the MOSH Inspector. Supplementary information was gathered from newspaper accounts of the incident and the medical examiner's report.

The employer, a multinational firm that specializes in elevators, escalators and autowalks, was one of many subcontractors working on the construction project. They had installed and were performing final adjustments to hydraulic elevators that provide service between an underground parking garage and the ground level of the building. The elevator construction company and the elevator service company were subcontractors to the general contractor. The general contractor had been in business for more than 90 years and maintains a comprehensive safety program; they have approximately 5,000 employees, with about 190 on this site. Both subcontractors involved with the elevator installation have written safety programs and requirements for personal protective equipment. However, there were no written instructions or procedures for the task of adjusting the hydraulic cylinder.

INVESTIGATION

Construction of a hydraulic elevator begins by boring a hole in the ground a little wider and deeper than the hydraulic cylinder. Since it is in contact with the earth, they then wrapped the cylinder in a coating material to protect it against galvanic action. Then the cylinder is placed in the hole and plumbed. The cylinder is then welded to a support frame, prior to the installation of the elevator car. Once the elevator car is installed in the hoist way and bolted to the cylinder's plunger, the car is aligned according to the elevator code.

Three elevators provide service between the underground parking garage and the ground level of the building. The platen, on the bottom of the cars, is bolted to the hydraulic plunger and was touching the cylinder head before the cars were resting fully on the buffers. To meet the elevator code, it was necessary to cut the hydraulic cylinder loose from its supporting fixtures and lower it (into the pre bored hole) so that when the car fully compresses the buffers, the platen would not touch the cylinder jack head.

Tuesday, September 24, 1996, the victim had worked on elevator L3. He was assigned the task to lower the hydraulic cylinder so the elevator car when lowered to the buffers, would not contact the cylinder jack head, as required by the elevator code. Car L2 was checked and found to have the same problem and since car L1 was in the same bank, the same clearance problem existed. The injured began helping the victim on car L2.

To make the adjustment, the hydraulic system was used to raise the elevator car approximately

thirteen feet above the floor of the pit (which was approximately 42" below the garage level of the building). The victim and the injured entered the pit and placed two 4x4 wood poles, approximately twelve-feet long, on end, under the elevator car, one on each side leaning against the guide rails (not tied in place) below the guide shoes. The two 4x4s were to prevent the car from dropping during the adjustment process. The 4x4s did not support the elevator car, since their tops were approximately fifteen inches below the bottom of the car. Throughout this procedure, only the hydraulics in the cylinder and the plunger supported the weight of the 4500 lb. elevator car. They removed the buffers under each car, to gain access to the cylinder support welds. Buffers are intended to provide a vertical clearance of not less than twenty-four inches under the car and to provide a fixed stop before the plunger reaches its down limit of travel. When the welds holding the cylinder to the support framework were cut, the hydraulic cylinder was supposed to slide slowly into the pre-bored oversized hole. The cylinder would then be welded to the support framework and the buffers reinstalled. This process was completed twice by the victim, without any problems.

They started the same procedure on the third elevator L2. However, when the victim cut the hydraulic cylinder from its support, it dropped farther into the pre-bored hole than anticipated. In doing so, the downward drop of the cylinder pulled the two-inch diameter hydraulic pressure line pipe out of the cylinder nipple coupling. Evidence showed that approximately 1/2" of the hydraulic supply line was stripped out of the nipple. When the hydraulic line was pulled out of the nipple by the sudden and unanticipated change in position of the cylinder, the weight of the elevator car forced the hydraulic fluid out of the cylinder allowing the car to fall. As the car fell, it missed one 4x4 with a glancing blow. The other 4x4 pierced the floor of the elevator car as it fell. The injured (who was wearing a hardhat) was standing in an upright position when the car struck him. The victim was apparently in a kneeling position (not wearing a hardhat) when the elevator struck and pinned him.

In trapping the two workers, the elevator did not fall evenly to the pit level. The injured was stunned by the blow but was able to shut off the cutting torch which was not lit but still discharging gas. Others working in the area called for emergency services, which arrived within ten minutes. Rescuers removed the injured helper first. However, they had to use air bags to raise the elevator to remove the victim.

CAUSE OF DEATH

The medical examiner determined that the cause of death was the result of head and neck injuries and compression asphyxia.

RECOMMENDATION / DISCUSSION

Recommendation # 1: Employers should train employees in the recognition of hazards, and methods to control hazards.

Discussion: 1926.20(b)(2) states, “. . . provide for frequent and regular inspections of the job sites, materials, and equipment to be made by competent persons designated by the employers.” Employees should never be permitted to work under a load whose support failure would place them in a hazardous position. After being raised to the appropriate level with the hydraulic system, screw jacks of appropriate capacity should have been used to support the elevator car. This would permit the weight of the elevator car to be safely held in place in case of catastrophic failure of the hydraulic system. It would also permit a gradual controlled lowering of the elevator car and the hydraulic cylinder.

Recommendation #2: Employers should implement and enforce comprehensive written instructions for making adjustments to hydraulic elevators.

Discussion: Based on information received, there were no written procedures for the task being performed. Management of the subcontractors should have coordinated and determined safe work procedures for the task of adjusting the hydraulic cylinder. Prior to making adjustments to the cylinder with the car securely blocked, the platen could be unbolted from the bottom of the car and the plunger lowered into the cylinder. Elevator codes require buffers to be installed in the pit. One of the functions of the buffers is to provide refuge space for persons working in elevator pits. They provide a minimum clearance of two-feet between the lowest projection on the underside of the car's platform (not including guide shoes and aprons attached to the sill) and any obstruction in the pit (exclusive of compensating devices, buffers, buffer supports and similar devices). These measurements should be taken when the car is resting on fully compressed buffers (ASME A17.1, Rule 300.3a).

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FATALITY ASSESSMENT AND CONTROL EVALUATION

The Maryland Division of Labor and Industry administers the Fatality Assessment and Control Evaluation (FACE) Program under a cooperative agreement with the National Institute for Occupational Safety and Health, Division of Safety Research (NIOSH/DSR). The Maryland FACE Program performs Investigations of selected occupational fatalities, prepares summary reports, and engages in prevention activities. The goal of our program is to prevent fatal work injuries in the future by studying the working environment, the worker, the task being performed, the tools employed, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

NIOSH/DSR developed the FACE research protocol in the early 1980's and continues to perform FACE investigations. To increase the research and prevention activities of NIOSH/DSR, states across the nation have been invited to participate in the State FACE Project. Maryland and thirteen states listed below currently participate in the State Based FACE Project: Alaska, California, Colorado, Iowa, Indiana, Kentucky, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Wisconsin, and Wyoming.

Additional information regarding this report or the Maryland FACE Program is available from:

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