The National Institute for Occupational Safety and Health (NIOSH)

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Fatal Accident Summary Report: Mechanic Dies in Elevator Machine Room

FACE 8419

INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), is currently conducting the Fatal Accident Circumstances and Epidemiology (FACE) Study. By scientifically collecting data from a sample of similar fatal accidents, this study will identify and rank factors which increase risk of fatal injury for selected employees.

At approximately 3:00 p.m. on August 8, 1984, a journeyman elevator mechanic was found dead on the floor of an elevator machine room. The attending medical examiner notified DSR and requested technical assistance in determining whether the death was accidental (possible electrocution).

CONTACTS/ACTIVITIES

Upon receiving this technical assistance request, DSR sent a research team, consisting of an epidemiologist, an industrial hygienist and a consultant with expertise in electrical energy, to provide a field evaluation of this fatality. On August 16, 1984, the research team met with the medical examiner who provided a history of the case and autopsy results. The medical examiner then accompanied the team to the building where the accident occurred. A site survey was conducted and information for the survey was gathered in the following manner: 35 mm and video documentation; the building superintendent was interviewed; the engineering schematics for the elevator system were reviewed. Subsequent interviews were held with the company representative (supervisory engineer), next-of-kin and co-worker.

BACKGROUND

The elevator machine room where the victim was found is located in a senior citizen building owned by a city housing authority. This ten story building contains 130 apartments and is serviced by two elevators. The city housing authority contracts with the local office of a national elevator service company to inspect and perform maintenance on elevators in several buildings owned by the authority. This local office employs approximately twenty field workers, including five repair teams each of which consist of a journeyman elevator mechanic and helper. At the time of his death, the mechanic had fifteen years experience and had been with his present employer for eight months.

The Deputy Medical Examiner performed an autopsy and the only notable findings were an enlarged heart and a thermal and electrical burn wound above the elbow of the left arm. The pattern of this burn wound matched the motor resistor coils found inside the machine room. The worker had no history of cardiovascular disease nor any other pertinent diseases/injuries. He weighed in excess of 330 lbs. but was accustomed to performing hard physical labor.

Information collected through surveying the site, reviewing the engineering schematics, and interviewing the company representative explained the mechanics of the elevator system. The alternating current drive motor is a 20 horsepower, 1160 rpm, 3 phase, and 220 volt induction motor. To reduce the high starting current of this motor, resistor coils are placed in series with each field coil of the “Y” connected motor. A set of centrifugally operated contacts close after the motor reaches full running speed (3-4 seconds), thus full line voltage is applied through the contacts (by-passing the resistors) but the resistors are still energized. A total of twelve starting resistor coils are used for the drive motor.

The field evaluation of the elevator machine room where the victim was found revealed the following conditions:

a) close and/or cramped work space

b) excessive heat (greater than 1000F)

c) limited ventilation

d) The floor was being painted with a polyurethane floor paint whose vapors, according to the co-worker, “could get you high or dizzy.” Contact with the manufacturer of the paint revealed that the polyurethape was an oil-modified resin which contained no toluene disocynate (tdi). The manufacturers chemical data sheet lists the hazardous materials as mineral spirits and methoxyethanol which could present a health hazard from breathing the fumes.

SYNOPSIS OF EVENTS

After reviewing all the facts collected through the interviews and the site survey, the following scenario appears to be the most likely sequence of events.

On August 8, 1984, the mechanic and his helper were doing routine maintenance on two elevators in the senior citizen building. The maintenance being performed in the elevator machine rooms, located on the roof of the ten story building, consisted of changing oil in the gear reduction system, cleaning the machinery, and general work (such as cleaning and painting the cement floor). While maintenance was being performed in one of the elevator machine rooms, it was necessary to de-energize the system, thereby leaving only one elevator in operation. No type of positive lock-out was used on the main power switch. In the morning, the mechanic and helper worked together in one machine room. After lunch, the mechanic and helper returned to the machine room. The mechanic decided to paint the floor while the helper would work in the other machine room. The helper stated that, “The power was off when he left to go to the other machine room.” It is believed that after the mechanic finished painting around the hoisting cable, he re-energized the equipment to avoid inconvenience to the elderly in the building. This placed both elevators in service. Whether aware or not aware of the potential hazard of working in close proximity to an unprotected and intermittently energized power source, the mechanic was confronted with the following problems: excess heat, poor ventilation, paint vapors and cramped working conditions. These conditions may have predisposed the mechanic to either collapse, lose his balance, or slip in the paint so that he contacted the unguarded energized resistor coils. This contact probably occurred either at the instant the motor was set in operation or within twenty to thirty seconds after it started. Simultaneous contact with some portion of the metal or other conductive material in the immediate vicinity such as the hoisting equipment, the control cabinet, the centrifugal governor switch, or any other material at ground potential would permit electrocution to take place. The voltage developed between the resistors and ground would be approximately 125 to 140 volts depending upon the exact line voltage (220-240 volts). The coil imprint on the left arm was a thermal burn possibly coupled with an electrical burn.

At approximately 2:30 p.m., the helper returned from the other elevator mechanic room to see how the mechanic was doing. He found the mechanic lying face down on the floor between the hoisting equipment and the control panel. The helper then contacted the building superintendent. The city emergency medical squad was summoned, arrived at the scene

within 15 minutes, turned off the power inside the machine room, and tried to revive the mechanic. The victim was transported to a nearby hospital where he was pronounced DOA.

CONCLUSIONS/RECOMMENDATIONS

Based upon available information the mechanic, who had a negative medical history, has placed himself in vulnerable location which probably facilitated contact with an unguarded resistor coil which was energized and thermally hot.

Recommendations specific to the occurrence of this fatality are as follows:

1) Elevators should be upgraded to meet the American National Standards Institute Safety Code for Elevators and Escalators (ANSIASME A 17.1).

2 When work procedures require workers to come into close proximity to energized sources, the source should be locked out in an ‘off” position to prevent electrocution (Guidelines for Controlling Hazardous Energy During Maintenance and Servicing, DHEW/NIOSH Publication No. 83-125).

3) Adequate ventilation should be provided in enclosed areas where excess heat vapors or fumes may present a hazard to workers (Criteria for a Recommended Standard-Working in Confined Spaces, DHEW/NIOSH Publication No. 80-106).

4) Employee should be trained or retrained concerning recognition of hazards in specific work environments.

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