The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Injection Mold “Set-Up” Man Electrocuted in Tennessee

FACE 87-21

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) Project, which is focusing primarily upon selected electrical-related and confined space-related fatalities. The purpose of the FACE program is to identify and rank factors that influence the risk of fatal injuries for selected employees.

On November 12, 1986, a “set-up” man was electrocuted when he simultaneously contacted an injection molding machine which was grounded and a grinding machine with a ground fault.

Contacts/Activities:

Officials of the Occupational Safety and Health Administration for the State of Tennessee notified the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) of this fatality and requested technical assistance. This case has been included in the FACE Project. On January 26, 1987, a member of the DSR research team met with company management personnel. The accident site was visited and photographed. Interviews were conducted with two comparison workers and a surrogate for the victim.

Background/Overview of Employer’s Safety Program:

The victim was an injection mold “set-up” man for a plastics manufacturing company. The company manufactures plastic components (i.e., plastic lawnmower wheels) for other companies. There are no safety meetings and no designated safety officer. While there is a written safety manual, it appears to be used infrequently. All training is “on the job.”

Synopsis of Events:

The victim, a co-worker, and a supervisor were working to “set-up” an injection molding machine. The plastic parts being manufactured were defective and the victim opened a door to the molding machine to remove and examine one of the plastic parts. As he closed the door with his left hand, he supported himself with his right hand by holding the metal handle of the nearby portable grinding machine, which was used in recycling scrap plastic. An energized wire to a safety interlock (a switch designed to stop the grinder when the top cover was opened) apparently was contacting the metal case of the

switch, electrically energizing the switch and the metal case of the grinder at 270 volts. The victim's body provided a path to ground from the energized grinder to the grounded injection molding machine. Due to involuntary muscular contraction ("can't let go" phenomenon), the victim could not let go of either handle. His co-worker noticed that "something was wrong" and grabbed the victim from behind. He received an electrical shock, but was not injured. The supervisor then went to the electrical panel (a few feet away) and de-energized both machines.

The victim collapsed and an attempt at cardiopulmonary resuscitation (CPR) was made by co-workers. The plant is located in a rural setting and the emergency medical service (EMS) did not arrive for approximately 16 minutes. Ambulance personnel stated that no one was performing CPR when they arrived, no one at the scene was certified in CPR, and apparently only mouth-to-mouth efforts (without chest compressions) had been attempted. The victim was blue in color, had no pulse or respiratory effort, and had a "flat" (no electrical activity) electrocardiogram. It was felt that the victim was beyond help at this point and no further resuscitation efforts were made.

Cause of Death:

The medical examiner found no burns on the victim's body. He ruled the cause of death to be "accidental electrocution," since the victim had no history of heart disease and a co-worker who tried to aid him was "shocked." No autopsy was performed.

Recommendations/Discussion:

Recommendation #1: All electrical systems should be inspected periodically by qualified electricians and undergo routine preventive maintenance as prescribed by the equipment manufacturer.

Discussion: The plant engineer stated that the plug of the grinder was loose in the receptacle and that there was evidence of "arcing" on the back of the receptacle. The receptacles were ceramic and had been in service for many years. Apparently, a continuous path to ground was not provided for the grinder, in accordance with Section 250-51 of the 1987 edition of the National Electrical Code (due to poor mechanical contact at the receptacle). Receptacles should be routinely tested with a receptacle tension tester to ensure that good mechanical contact is made; the resistance to ground of all grounded equipment should be verified periodically. Electricians were brought in from outside the plant to locate and repair the electrical problem after the accident occurred. Qualified electricians should also provide routine preventive maintenance for all electrical equipment.

Recommendation #2: Safety should be a design consideration in all electrical installations.

Discussion: The safety interlock, a design modification, was electrically energized at 270 volts. This voltage is greater than necessary; using a transformer to step down the voltage to the safety interlock would provide for a safer installation. Electrical equipment design modifications should only be done by qualified personnel.

Recommendation #3: The handles of all metal enclosures housing electrical equipment should be non-conductive (insulated).

Discussion: After the accident, the company installed insulation on the metal handles of some electrical equipment. Non-conductive (insulated) handles are not currently required by the National Electrical Code; however, many low voltage electrocutions occur when the victim "can't let go" after grasping an energized metal handle. While non-conductive (insulated) handles should not be considered a substitute for effective grounding, it would increase the overall safety of the equipment. This recommendation will be submitted to the National Electrical Code Committee for consideration.

Recommendation #4: The company should develop a planned response to emergencies.

Discussion: The plant personnel who attempted CPR apparently did not have current certification. Provision should be made to ensure that all work shifts have qualified individuals with current CPR certification available. Employers in rural areas may want to discuss the feasibility of obtaining an automatic defibrillator with their plant physician or medical

consultant. Prolonged EMS response times to rural locations (greater than eight to ten minutes) make successful resuscitation of a cardiac arrest victim unlikely.

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Last Reviewed: November 18, 2015