

Electronics Technician is Electrocuted While Servicing a Microwave Oven

DATE: June 28, 1991

SUMMARY

On March 20, 1991, a 42-year-old male electronics technician was electrocuted while working on a microwave oven. Using a pair of small needle-nosed pliers, he received approximately 2,500 volts of electricity while repairing or trouble-shooting the unit. NJDOH FACE personnel concluded that the following safety guidelines should be followed:

- *Equipment must be de-energized prior to performing repairs;*
- *All equipment must be grounded;*
- *Workers must be educated about the dangers of working on appliances that carry high voltage electricity;*
- *Signs and symbols must be appropriately placed to warn about potential exposure to high voltage electricity;*
- *All workers should be trained in basic CPR.*

INTRODUCTION

The county medical examiner reported this work-related electrocution to NJDOH FACE personnel on March 21, 1991. NJDOH FACE personnel visited the site of the fatality on March 22, 1991. We interviewed the employer and a witness, photographed the site, and discussed the incident with the OSHA compliance officer who had investigated the fatality the prior day. Information was also derived from the police report and volunteer rescue squad report.

According to the employer, the victim was trained as an electronics technician in his native country and was previously employed in that capacity by a large company in the United States. The owner had worked for the same firm in the past. Laid off from that job, the victim was hired to work two or three days a week for this company.

The employer is a small company which receives "ex-stock inventory". They inspect, repair and repack televisions and microwave ovens which have been returned to the sellers. The business had been in operation for fifteen months and employed five persons, including the victim.

INVESTIGATION

On March 20, 1991, the victim had completed his assigned tasks and the company owner asked him to check some microwave ovens. He reportedly knew the equipment well but had not worked on this particular type of oven for a year. The microwave was connected to an ungrounded extension cord; the extension cord was plugged into a gang box (a multi-outlet receptacle). The gang box was not grounded because it was improperly wired into the building current. No ground fault circuit interrupter (GFCI) was present; none was required.

The decedent placed the microwave on a workbench, opened its case, and exposed its inner components. At some point he energized the appliance. With his left hand on the metal edge of the case, he held a 4-inch pair of needle-nose pliers with his right hand. The rubber insulation on the handles was abraded. Trying to wire a high voltage transformer (about 2,500 volts) to the magnetron, (the component that emits the microwaves) he used the pliers to slide a wire blade connector onto a prong on the transformer. He may have touched a parallel wire with the small pair of pliers, causing a high voltage arc.

A co-worker heard the victim yell and saw that he was shaking and frozen to the microwave with one hand on the case and one hand on the pliers. The co-worker immediately pulled him away from the workbench and broke the electrical contact. His rescuer felt no shocking sensation, possibly because he wore sneakers with rubberized soles. As the victim was pulled away, he said "power" and the microwave oven fell to the floor. The co-worker lowered him to a supine position on the floor and disconnected the power to the appliance.

The employer arrived at the scene immediately and noted that the technician was unconscious with no pulse or breathing. He was untrained in cardio-pulmonary resuscitation (CPR) but, having watched a film about it, attempted chest compressions, but without rescue breathing. Help was summoned by telephone, and police arrived in approximately five minutes. The police continued rescue attempts with CPR until paramedics arrived to offer advanced life support. The rescue squad transported the victim to the local hospital emergency room where he was pronounced dead approximately one hour later.

CAUSE OF DEATH

The medical examiner determined that death was caused by electrocution. Burns were noted on both hands.

RECOMMENDATIONS/DISCUSSIONS

Recommendation #1: Equipment must be de-energized prior to performing repairs.

Discussion: Since it is necessary to first determine what defects exist in an appliance (a process known as trouble-shooting), a worker must often inspect the unit while it is energized. The unit must be de-energized before any work is done and re-energized only after all work has been completed. In this case, the employee appears to have neglected to disconnect the unit or was attempting to service it while the oven was connected to the power source. The employer did not have the manufacturer's service manual for the specific model of microwave on which the victim was working. He did have the service manual

for similar models by the same manufacturer, which clearly states "When parts must be replaced, remove the power plug from the outlet." The manufacturer also cautions "Never touch any circuit with an insulated tool during operation." Removing the possibility of contact with electrical energy is the safest method of avoiding death or serious injury.

Recommendation #2: All equipment must be grounded.

Discussion: The extension cord used to power the microwave oven was an ungrounded two-wire cord which was plugged into an improperly grounded gang box. Although it is uncertain if grounding would have prevented this electrocution, OSHA regulations and common electrical practice require properly grounded electrical equipment. The manufacturer's service manual states "Do not operate on a 2-wire extension cord." Use of an adapter (i.e., the extension cord) which interrupted the continuity of the ground connection is a violation of CFR 1910.334 (a)(3)(iii). ¹

Recommendation #3: Workers must be educated about the dangers of working on appliances that carry high voltage electricity and in the use of safe work practices.

Discussion: The appliance that was being serviced operated with unusually high voltage (2,500 volts) and current, greatly increasing the risk of accidental electrocution. Workers must be educated about the dangers of working on appliances that carry high voltage electricity. Although the victim was reportedly trained and experienced from his previous employer, this company did not provide him with any additional or refresher training. The manufacturer's service manual should be available to workers and consulted as needed.

It should be noted that the proposed OSHA standard 29 CFR 1910.333(c)(2) ² will require that persons who work on energized circuits "shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools." This standard will be in effect in August, 1991.

Recommendation #4: Signs and symbols must be appropriately placed to warn about potential exposure to high voltage electricity.

Discussion: This workplace did not have signs warning about the presence of dangerous electrical hazards. As required under 29 CFR 1910.335(b)(1) ³, safety signs, symbols or tags should be used to warn employees about dangerous electrical hazards. As this is a multi-lingual workplace, the signs should be in all the languages spoken and/or in universally recognized symbols.

Recommendation #5: All workers should be trained in basic CPR.

Discussion: The timely use of CPR is the only effective first-aid treatment for cessation of breathing or heart beat pending the arrival of persons capable of delivering advanced life support. It is recommended that all workers should be trained in basic CPR.

REFERENCES

1. 29 CFR 1910.334(a)(3)(iii) Code of Federal Regulations, Washington, DC: US Government Printing Office, Office of the Federal Register.
2. 29 CFR 1910.333(c)(2) Code of Federal Regulations, Washington, DC: US Government Printing Office, Office of the Federal Register.
3. 29 CFR 1910.335(b)(1) Code of Federal Regulations, Washington, DC: US Government Printing Office, Office of the Federal Register.

FATAL ACCIDENT CIRCUMSTANCES AND EPIDEMIOLOGY (FACE) PROJECT

Staff members of the FACE project of the New Jersey Department of Health, Occupational Health Service, perform FACE investigations when there is a work-related fatal fall or electrocution reported. The goal of these investigations is to prevent fatal work injuries in the future by studying: the working 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.

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