



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



29-Year-Old Welder Electrocuted in Ohio

FACE 85-28

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 fatalities. By scientifically collecting data from a sample of fatal accidents, it will be possible to identify and rank factors that influence the risk of fatal injuries for selected employees.

On June 18, 1985, at approximately 3:45 a.m. a 29-year-old maintenance worker was electrocuted as he attempted to turn off a welder.

Contacts/Activities:

The Division of Safety Research received an invitation from the Industrial Commission of Ohio to provide technical assistance in the evaluation of this fatality. It was determined that this incident would be included in the Fatal Accident Circumstances and Epidemiology (FACE) Project. A research team consisting of two safety specialists and an engineering consultant held discussions with representatives of the Ohio Industrial Commission's Division of Safety and Hygiene. Two Industrial Commission Safety Consultants accompanied the research team to the local police department, where they examined and photographed the welder and the receptacle that the welder was plugged into at the time of the accident. An interview was conducted with the plant engineer of the steel treatment plant that employed the victim. However, photographs of the accident site and co-worker interviews were precluded in this case. A telephone interview was conducted with the coroner to determine electrical entry and exit points and other information applicable to the FACE project. The next of kin interview was postponed until a later date due to the emotional state of the victim's wife.

During the interview with the plant engineer, it was learned that the plant had no written safety policy or safety program.

Synopsis of Events:

Since co-worker and eye witness interviews could not be conducted, the local police "Casualty Case Report" was used to summarize the facts surrounding this incident.

On June 18, 1985, at approximately 3:45 a.m. a maintenance man at a steel treatment plant was walking along a metal walkway in the plant, when he discovered the victim lying on his back in a convulsive state. The maintenance man alerted other employees of the victim's condition and returned to the accident site. Upon return he noticed that the pull handle of the four wheel, wagon style cart (on which the welder was sitting) was lying in water on the concrete floor. Electrical arcs

were visible from the handle of the cart to the floor. As other employees arrived at the scene, one pulled the plug on the welder. The police and the fire department rescue squad were called. The rescue squad transported the victim to a local hospital, where he was pronounced dead at 5:08 a.m.

The examination of the welder at the local police station revealed that the cables on the welder (particularly the positive or electrode cable) had exposed conductors. Numerous cuts and abrasions exposed large areas of the conductor cables. Continuity checks on the four terminals of the welder plug indicated that the wiring of the plug cable provided an adequate ground path. The insulation on the welder's electrode holder was broken with large pieces of insulation completely missing. Inspection of the receptacle box revealed that the cover plate was designed for a different style receptacle. Additionally, the receptacle box did not have a conductor (wire) attached to the ground terminal. A continuity check on the receptacle indicated an open circuit (no ground connection). Undisturbed paint on the screws and around the cover plate of the box indicated that the box had not been opened and it can be concluded that the ground connection was not present at the time of the accident. Without a complete ground connection, the victim could have completed an electrical conducting path from the frame of the welding machine or any one of the uninsulated areas on the cables. Water on the floor increased the area that could result in a ground fault and reduced the resistance of the path to ground.

The coroner stated that a severe burn compatible with an electrical burn was present on the victim's right index finger. This would lead to the conclusion that the victim's finger came into contact with the welding machine's frame when the victim was trying to turn the welding machine off. This action completed the conductive path and resulted in the electrocution of the victim.

Recommendations/Discussion

Recommendation #1: Electrical systems should satisfy the requirements of the National Electrical Code.

Discussion: Although only one receptacle from the plant was examined, the lack of a grounding conductor in that receptacle suggests there may be a serious problem with the plant's electrical system. The plant's electrical system should be inspected and modified to satisfy the applicable requirements of the National Electrical Code. The existence of a proper grounding system in this case would have greatly reduced the risk of serious injury.

Recommendation #2: The employer should initiate a safety policy that addresses specific tasks and stresses safety training and hazard awareness.

Discussion: The company did not have a safety policy that addressed safety training and procedures specific to maintenance work and other high risk tasks performed in the plant. Written procedures should detail the various safety hazards associated with these tasks. Once these procedures and safety training are developed, the employer should assure that they are implemented and enforced.

Recommendation #3: The employer should implement a preventive maintenance program to assure that equipment is in safe operating condition.

Discussion: Periodic inspections should be performed on all plant maintenance and production equipment. These inspections should identify any hazards present and management should take appropriate corrective action. These inspections should be complemented by daily inspections of equipment by qualified personnel before the equipment is put into use. These daily inspections should include the identification of such hazards as cuts or abrasions on conductive cords, loose plug connections or cable entrances on machines, or any other unsafe conditions. Had a preventive maintenance program been utilized at the plant, it is unlikely that the welding machine involved in the incident would have been in such a state of disrepair.

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Partly

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