DATE: October 29, 1992

FROM: Fatality Assessment and Control Evaluation (FACE) Project
Minnesota Department of Health (MN FACE)

SUBJECT: MN FACE Investigation MN9204
Turkey Farmer Dies from Electrocution

SUMMARY

A 72-year-old male turkey farmer (victim) died as a result of electrocution when he came into contact with energized turkey feeder equipment. He was working alone at the time of the incident in a 300-foot-long barn housing 3,000 to 4,000 birds. According to police and coroner reports, the equipment had been malfunctioning and power to it had been disconnected the night before the incident. It is unclear whether the victim was attempting to repair the equipment or merely performing usual daily duties and accidentally made contact with an energized system component. A continuous mechanical ground or ground fault circuit interrupter was not in place as part of the electrical system that supplied power to the feeding equipment. Except for working boots, no personal protective equipment was used by the victim. MN FACE investigators concluded that, in order to prevent similar occurrences, the following guidelines should be followed:

> establish and maintain effective grounding as part of any electrical system to prevent the presence of fault current that could energize non-current carrying parts and to comply with Article 250 of the National Electrical Code (NEC);

> incorporate ground fault circuit interruption into electrical systems to protect workers against dangerous levels of fault current and to alert workers when a problem occurs within the system;

> establish and implement preventive maintenance programs for electrical equipment and electrical systems and ensure the implementation of these programs, especially when these systems are in hostile environments as detailed in Article 547 of the NEC; and

> extension cords constructed for special service or purposes should be constructed of components that are laboratory (UL, Factory Mutual, etc.) approved for such service and should be tested for continuity with the electrical system.

INTRODUCTION

On May 21, 1992, MN FACE personnel became aware of an occupational electrocution, which had occurred on May 18, 1992, through a newspaper article. MN OSHA was contacted to confirm and collect available information about the incident. The county sheriff department was also contacted and a report was requested. On May 26, 1992, the county deputy coroner was interviewed and a report was requested. Arrangements for a site visit were made with the co-owner of the turkey farm on June 2, 1992, and a site investigation was conducted on June 4, 1992.

The victim had a total of 31 years experience in the turkey farming business. For the last 20 years, he had been a co-owner of an 18,000-bird turkey farm. The two owners, plus one unsalaried helper worked the farm. The victim had no formal training in electrical safety and hazards, but had conducted all the electrical and mechanical maintenance on the farm for many years.

INVESTIGATION

The incident took place in a 300-foot-long turkey barn with a dirt floor. The barn housed approximately 3,000 to 4,000 birds and contained two auger-driven feeding lines, which ran the length of the barn. The auger-containing pipe was approximately one foot off of the ground, suspended from the ceiling with link chain, with the feed bins resting on the ground. The grain hopper was situated at the south end of the barn and the motor, which supplied power to the auger within the feed line pipe, was at the north end of the barn. Feeding bins were placed at three-foot intervals along the line. During normal operation, the motor automatically supplied or shut down power to maintain feed in the bins.
An electrical panel with circuit protection present was situated at the south end of the barn. It was not determined whether the panel itself was grounded. A cable ran on the upper portion of the barn wall from this panel box to a junction box above the feed line at the north end of the barn. A homemade, two-conductor extension cord, which was not

connected to the panel ground wire running in the cable, hung down from the junction box to a receptacle at the feed line motor. The feed line motor's 110 V pigtail was connected to this receptacle. MN FACE investigators were informed by two different sources that this cord's insulation was badly worn, possibly from the birds pecking at it. It was wrapped around and supported on top of the metal motor body.

According to both the police and coroner's reports the feeder equipment had been malfunctioning the previous day and power to the feeder equipment had been cut off. It is not known whether the victim was attempting to repair the equipment or merely going about usual job activities when the incident occurred. The feed bins did not have feed in them at the time of the incident indicating that the motor had not run for some time. It was not determined whether power to the motor had been turned off or if a fault in the system prevented the motor from running.

The victim was in the barn alone at the time of the incident. When he failed to show up for lunch, a search was begun. He was discovered at the south end of the barn with both hands in contact with the auger pipe. A 911 call was placed and power to the entire barn was shut down. First responders attempted to resuscitate the victim with CPR but he was pronounced dead on arrival at the hospital.

CAUSE OF DEATH

The county deputy coroner reported the cause of death to be electrocution.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Establish and maintain effective grounding as part of any electrical system to prevent the presence of fault current that could energize non-current carrying parts and to comply with Article 250 of the NEC.

Discussion: In this instance, a mechanical ground was not maintained throughout the circuit that supplied electrical power to the turkey feeder motor. Ground continuity was broken when the extension cord was wired. As a result, when an electrical fault occurred in the system, fault current energized non-current carrying conductive components of the circuit instead of going to ground through the grounding conductor. When the victim contacted the energized auger pipe, he provided a path to ground for the current and was

electrocuted.

Recommendation #2: Incorporate ground fault circuit interruption into electrical systems to protect workers against dangerous levels of fault current and to alert workers when a problem occurs within the system.

Discussion: When properly incorporated into an electrical system that meets the current NEC, a ground fault circuit interrupter will open a circuit within 1/40 of a second when it senses a flow of fault current between 4 and 6 milliamps. The circuit will open before a harmful shock can be received. The action of the circuit opening should alert workers that an electrical problem exists, and the circuit should be immediately tested and repaired.

Recommendation #3: Establish and implement preventive maintenance programs for electrical equipment and electrical systems and ensure the implementation of these programs, especially when these systems are in hostile environments as detailed in Article 547 of the NEC.

Discussion: Components of electrical systems should be inspected for electrical integrity on a regular periodic basis. These inspections should include, but not be limited to, testing all plugs, receptacles, cables, grounding connections, and conductor connections. The system components should be visually inspected daily to identify any physical damage that may have occurred. These visual inspections are especially important in agricultural buildings because of the corrosive and hostile environment and could identify a potential hazard in an early stage where it could easily be controlled. Additionally, some hazards might develop that would not be identified by a maintenance inspection. For this reason, a certified electrician should periodically perform a comprehensive inspection of an entire facility's electrical system to ensure it complies with all applicable codes and to identify any potential hazards. Any problems that are identified should be corrected immediately.

Recommendation #4: Extension cords constructed for special service or purposes should be constructed of components that are laboratory (UL, Factory Mutual, etc.) approved for such service and should be tested for continuity with the electrical system.

Discussion: Though the extension cord that was in place at the time of the incident could not be viewed, some general suggestions concerning homemade extension cords is

warranted. Because this extension cord was going to be used in a corrosive atmosphere created by the turkey manure and subject to the hostile environment of pecking by the birds, only components approved for agricultural buildings should have been used in its construction as required by Article 547 of the NEC. Once construction of the cord was complete, it should have been tested to ensure that it did not disrupt the continuity of the circuit on which it was going to be used. In addition, any extension cord should be visually inspected daily to determine if any physical damage to the cord has occurred.

REFERENCES

1. The National Electrical Code-1990 Handbook, National Fire Protection Association, Quincy, Massachusetts, 1989.