TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Program

SUBJECT: Iron worker falls 19 stories after welding lead melts steel cage cable -- Iowa.

SUMMARY:
In February 1996 a 43 year old welder for an iron erection company died when his suspended metal cage fell 19 stories from the side of a new building. The victim and a co-worker had been arc welding on the west face of a new high-rise building, each supported separately in a metal cage suspended by a ½ inch steel cable. The victim had an electrical welding lead coming to his work area from above. This high amperage welding cable was in poor condition and had been repaired with electrical tape several times. Due to high winds, the welding cable came into direct contact with the steel cable supporting the metal cage. The insulation of the welding cable failed at this point, and in a shower of sparks, the welding lead arced to the support cable and melted both in two, sending the cage immediately to the ground.

The welder inside the cage was wearing a body harness and rope lanyard, attached to a nylon lifeline tied to a point above his work position. The cage is designed to allow a worker to slip through an opening in the top-front portion of the cage and remain supported by his/her lanyard if the cage should fall. However when this cage fell, it snagged the victim's lanyard on it's way down. Both the cage and the welder fell 19 stories, the cage landing on a catwalk on an adjacent building, and the welder landing in an alley. He was killed instantly.

RECOMMENDATIONS following our investigation were as follows:

- 1. *Welding leads should come from below suspended platforms or cages--not from an overhead position where shorts could damage supporting cables.*
- 2. *Welders should inspect welding leads prior to and during work for signs of damage and/or exposed wire that could cause a short.*
- 3. *Employers should make periodic inspections to ensure that safety equipment is in acceptable condition and worn according to manufacturer's recommendations.*
- 4. *Workers should ensure that their fall protective equipment is in acceptable condition and worn properly.*

INTRODUCTION
In February 1996 a 43 year old welder for an iron erection company died when his metal cage fell 19 stories from the side of a new building. The Iowa FACE program became aware of the incident from a newspaper article and began an immediate investigation. Information was gathered from the police report, local newspapers, and the victim's employer. A site visit was conducted on February 26 by two investigators from the Iowa FACE program. Photographs were taken of the accident site and the fallen cage, and we reviewed several photos of the involved lanyard and welding lead,

which were secured at another location.

The victim's employer was an iron erection company which had been in business for the last 30 years. They were involved in iron girder construction of many of the high rise office buildings in the area. It was a seasonal business that employed up to 100 employees in summer months. The victim was one of twelve workers from the iron company on-site at the time of the accident. Many other subcontractors were also present at the job site at different locations.

The iron company had an extensive safety manual that was written by the company president. Safety was a vital part of employee education and the company had taken efforts to comply with all OSHA regulations concerning fall protection training and recommended equipment.
Workers were given on-site talks once per week by the company safety coordinator or worksite superintendent. Most hired men were journeymen iron workers with years of experience who had received repeated reviews in fall protection. The victim had worked for this employer for the last 4 years. He was very familiar with company safety procedures being one of the company foremen.

INVESTIGATION
The victim and a co-worker began work at 7:00 A.M. welding tube girts on the western face of a new high-rise building. Both were suspended by separate metal cages anchored independently to the steel girders above them. Each cage was designed to hold one man, and was suspended by a stationary ½ inch thick steel cable. The cable entered the cage through two pulleys at its top, and ran through an electrical drive system which raised and lowered the cage up and down the side of the building. This drive mechanism was powered by a heavy duty electrical cord hanging down from the cage.

Each man was welding with a separate arc welder powered by portable rigs located at remote locations. The co-worker's welding machine was located a few floors below and his welding lead went up to his cage where it was secured to the cage with a piece of wire. The victim's welding machine was located on a floor above him , and his welding lead traveled up from the machine and came down to the victim (see diagram). The men had been working above this second welding machine the day before but chose that morning to start from the bottom of their work area and work their way up. So at the time of the accident the victim's welding lead and the support cable for the victim's cage were adjacent to each other above the cage.

Both men were wearing body harnesses and lanyards attached to separate lifelines made of one inch thick twisted nylon. Each man's lanyard was attached to his lifeline by a rope grab. Both men were working side by side on the western side of the building. The wind was quite strong that morning and they were having trouble keeping their hands steady, so at approximately 8:20 they decided to quit work. The co-worker used a scrap of 9 gauge wire to secure his cage to the building to prevent it from blowing around and then went to help the victim secure his cage. The victim was working near the SW corner of the building and was being blown around the corner which prevented him from tying off his own cage.

While the two were securing the second cage, they heard the sound of arcing and looked up to see sparks about 10 ft. above the victim's cage. The support cable melted in two immediately sending the man and his cage to the ground below.

The design of the metal cage provided clearance above the normal work station to allow a man to pass through if the cage did fall. However this clearance was only on the front portion of the cage, while the back portion contained pulleys and cabling. At the time of the accident, both men were in the process of securing the cage to the building with wire because of the wind. This anchor point could have caused the cage to shift to the side , and in this position the cage would have fallen on top of him adding significant weight (300 lbs) to the lanyard causing it to fail. The victim had his lanyard attached to the left D-ring of his safety belt, not to the back D-ring which was the proper attachment point for the harness. This location may have twisted his body when the lanyard became taut and prevented him from clearing the cage opening. Eyewitnesses were not able to determine exactly how the accident happened.

As part of company procedures, the victim had recently reviewed the use of personal fall protection equipment and was issued a new shock absorbing lanyard, however at the time of the accident he was using an older rope lanyard which was in poor condition. It remains unclear why he was not using this new lanyard. The man was also not using the leg straps of his fall protective harness. At autopsy the straps were found folded upon themselves and taped together with electrical tape.

The rubber insulation around the welding lead was in poor condition and was taped in many places. Apparently the victim had borrowed the lead from another construction crew on-site; the lead did not belong to the worker's employer. The insulation may have been damaged before the men began work or it was damaged due to the windy conditions that morning. This exposed and energized area of the lead came into direct contact with the steel cable supporting the cage, melting both the welding lead and the steel cable in two.

CAUSE OF DEATH

The cause of death was multiple fractures and internal injuries from a fall. Autopsy revealed findings consistent with this injury, noting the appearance of the body harness and lanyard.
All lab tests were negative for alcohol or drugs of abuse.

RECOMMENDATIONS / DISCUSSION

Recommendation #1 *Welding leads should come from below suspended platforms or cages--not from an overhead position where shorts could damage supporting cables.*

Discussion: Welding leads are frequently damaged on heavy construction sites and high rise jobs. Electrical tape provides a temporary fix but cable protection is reduced at these points. Repaired leads are hazardous and must be kept separate from supporting cables, electrical wires, conduits, or other vital structures where failure could endanger human life. Also, welding leads must be protected from physical damage while in use. In this case strong wind was blowing the cages and welding leads back and forth, and may have been the immediate cause of the damaged insulation prior to the accident.

Recommendation #2 *Welders should inspect welding leads prior to and during work for signs of damage and/or exposed wire that could cause a short.*

Discussion: This damaged welding lead was reportedly from another company at the construction site. It was impossible to determine if the lead was damaged prior to that morning or if it was damaged while the men were working. Arc welders should inspect their leads prior to use and should be alert for possible damage throughout their work day. Damaged insulation is a fire

hazard, as well as a hazard to workers on site.

Recommendation #3 *Employers should make periodic inspections to ensure that safety equipment is in acceptable condition and worn according to manufacturer's recommendations.*

Discussion: The safety director for this company had made periodic inspections and replacements of fall protective gear. The victim was issued a new lanyard, however he was not using it, nor was he properly wearing his harness. Employers should provide training and on-site supervision to ensure safe work practices are followed. Each worker shares responsibility to use the correct equipment and to inspect their own equipment prior to use. Old lanyards and lifelines have significantly reduced capacity due to deterioration from UV radiation, oils, welding sparks, and abrasion. Worn out safety gear must be identified and replaced to maintain safe working conditions for iron workers.

Recommendation #4 *Workers should ensure that their fall protective equipment is in acceptable condition and worn properly.*

Discussion: The victim was very familiar with fall protective guidelines and associated gear, but was using an old rope lanyard which was incorrectly attached to his harness. A good lanyard used in the correct position may have prevented this fatality. The fact that the victim deliberately chose not to use leg straps on his full body harness indicates a casual approach to fall protection.

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Fatality Assessment
&
Control Evaluation Program
(FACE)

The University of Iowa, in conjunction with the National Institute for Occupational Safety and Health (NIOSH), is investigating the causes of work-related fatalities in the State of Iowa. FACE is a surveillance program that identifies all occupational fatalities, conducts in-depth, on-site investigations on specific types of fatalities, and makes recommendations for employers and farmers to help prevent similar fatal accidents in the future.

Iowa is a major farming state, and therefore the Iowa FACE Program deals with many occupational deaths on the farm. It is a very hazardous profession that claims hundreds of lives nationally every year. We publish detailed reports that are disseminated to key agricultural leaders in Iowa who share our concern for the safety of farmers. To reach and effectively communicate with this independent and vulnerable group is a worthy challenge here in Iowa.

NIOSH funded state-based FACE Programs include: Alaska, California, Colorado, Georgia, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Wisconsin, and Wyoming.

Additional information regarding this report or the Iowa Face Program is available from:

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