

**TO: Director, National Institute for Occupational Safety and Health**

**FROM: Iowa FACE Program**

**SUBJECT: Construction worker falls head first into 16-foot concrete pit -- Iowa.**

### **SUMMARY**

A 57-year-old construction worker was killed when he fell through plastic sheeting covering a recently-constructed concrete pit. The footing for the new pit was one foot above ground level and the entire pit was covered with a temporary 2" x 4" frame and plastic sheeting to help the concrete cure. There was no guard railing around the pit for it was to be covered with a permanent cover of heavy wire mesh within a few days. The victim had just finished a break, and was returning to the worksite. He was following his supervisor walking around a 4-foot concrete footing that was adjacent to one corner of the new pit (see photo 1). The supervisor heard a grunt and turned to see the victim crouched on his knees at the edge of the pit with his arms stretched out on the 2" x 4" frames. Then he saw the man attempt to get up, then fall through the plastic into the 16-foot deep pit. The man landed in 1½ feet of water in the base of the pit and received fatal head injuries. He died a few hours later in the hospital. Apparently the victim was retrieving something he had dropped on the plastic when he lost his balance and fell forward, or he may have slipped on the icy ground and fell. He was not wearing a hard hat. Autopsy results ruled out heart attack or other vascular/seizure disorders that may have preceded the fall.

### **RECOMMENDATIONS based on our investigation were as follows:**

- 1. The hazardous area around a pit or dangerous opening should be protected with barricades, guard rails, or colored banner tape [CFR 1926.501(b)(4)(ii)].*
- 2. The employer should train supervisors and workers to work safely in and around machinery pits.*
- 3. Workers should wear a hard hat while in areas where there is danger from impact, or from falling or flying object [CFR 1926.100 (a)].*

### **INTRODUCTION**

In the fall of 1996, a 57-year-old maintenance worker for an industrial property management company was killed when he fell to the bottom of a 16-foot concrete pit. The Iowa FACE program was notified immediately from the Iowa Department of Labor and began an investigation. A site visit was conducted three days after the incident by an Iowa FACE investigator and a member of WORKSAFE IOWA, a University of Iowa consultation service. Other information was gathered from company representatives, local newspapers, and the county medical examiner. Detailed photographs of the site were taken.

The employer was an industrial maintenance company that was managing a vacant manufacturing facility of over 2 million square feet. The facility was open year round and had several smaller industrial clients leasing space for assembly and warehouse use. The maintenance company was 1½ years old and had 15 employees who were previously employed by a large manufacturer at the same site. The victim was part of a 4-man crew

constructing a new concrete feeder pit for a biomass boiler that was being installed at this facility.

Employees at this company had been formally trained in several areas of safety that were appropriate for their industrial work, but received only general warnings about pit safety. There were several machine pits at this facility but no written policies concerning working in/around pits. No fall-protection program was in place, as employees do not routinely work in situations where fall protection is needed. The last formal safety training session was 10 months prior to the incident. The victim was previously a steam fitter, and had 24 years experience working at the same site prior to his position with this maintenance company. He was very familiar with construction procedures and had worked around many machine pits at this facility over the years.

## **INVESTIGATION**

The 4-man crew was preparing for the installation of a new biomass boiler designed to receive wood chips, sawdust, and other combustible materials. The boiler required construction of a 58' by 20' concrete feeder pit which would receive the combustible materials. The pit was 12 feet deep at one end and 16 feet deep at the end where the victim fell. The footing for the pit was one foot above the ground where the man fell in, and the entire pit was covered with a 2" x 4" wooden framework covered with plastic sheeting (see photo 1). The walls of the pit had been poured only two days prior to the accident, and the plastic covering was to protect from the weather and help cure the concrete. A permanent cover of steel mesh was to be installed the following week.

The victim and his supervisor were returning from a break, the victim walking approximately 10 feet behind his supervisor. There was a 4-foot high concrete footing separating the break area and their work area (see photo 2), so the men had to walk around one side or the other of the footing. The far edge of the footing was on level ground in a safe area; the closer edge was adjacent to the corner of the new feeder pit. Apparently for convenience, the men chose to walk through this narrow point, stepping across the corner of the pit covered with plastic. At this point, there was very little room to walk through, and the men needed to hang onto the adjacent cement footing (see photo 2).

The supervisor heard a grunt and turned to see the victim with his knees on the concrete footing of the pit with his arms sprawled across the 2"x 4"s (approximately 4 feet apart). Then he saw the victim moving his arms momentarily, apparently trying to hang on, before the man completely lost his balance and plunged through the plastic down into the pit, which had ~18 inches of water standing in it. The victim was 6 feet tall and weighed 260 pounds. He apparently could not get a good grip on the plastic-covered 2" x 4"s and fell head first to the bottom of the pit and suffered massive head injuries. Other workers immediately ran to help the victim, gaining access to the pit through an existing hole in the lower portion of the wall. When the victim was pulled from the water he had obvious head injuries. He was immediately taken to a local hospital and died a few hours later. Autopsy findings ruled out a heart attack or cerebrovascular accident prior to the fall. It appears the man was deliberately kneeling on the concrete edge of the pit with his hands on the 2" x 4"s, perhaps retrieving something he had dropped onto the plastic. However, the ground and the pit footing were icy from freezing rain,

and he may have slipped and fell while attempting to walk over the corner of the pit. At the time of our investigation, a pair of orange work gloves were seen floating on the water directly under the hole in the plastic. These may have been dropped by the victim.

The plastic covering the pit was opaque due to condensation, giving a false sense of safety. At the time of our visit the pit was surrounded by a steel guard railing, with the perforated area of plastic covered with plywood.

### **CAUSE OF DEATH**

From the coroner's report, the cause of death was "*massive closed head injury.*" Autopsy was negative for cardiac event or cerebral vascular event prior to the fall. Toxicology was negative.

### **RECOMMENDATIONS / DISCUSSION**

**Recommendation #1** *The hazardous area around a pit or dangerous opening should be protected with barricades, guard rails, or colored banner tape [CFR 1926.501(b)(4)(ii)].*

**Discussion:** Most of the perimeter around the pit had been filled in with dirt making it possible for a worker or observer to walk directly up to the pit edge. In addition, the plastic covering the pit was opaque giving a false sense of security. The employer should ensure that supervisors and workers are not allowed to enter hazardous areas. A hazardous pit of this type should be protected by a barrier to remind workers and keep others away from the pit opening. The 2" x 4" frame and plastic were not designed as a safeguard, but were only a temporary covering. In this case the employer could have eliminated access around the dangerous area of the footing, or constructed a safe walkway with guardrails across the pit corner. Restricting entry into hazardous zones like this pit could prevent similar fatalities.

**Recommendation #2** *The employer should train supervisors and workers to work safely in and around machinery pits.*

**Discussion:** Employees did not recognize the hazardous condition which existed at this site. No protective zone was being observed at the site by workers who routinely entered the dangerous area. Covering the pit with a wood frame and plastic was not an adequate safeguard. The employer should assign responsibility for site safety to a competent person who could determine control zones where fall hazards exist. The employer is responsible for establishing safe work procedures and communicating them to supervisors and workers. Supervisors must be trained in safety rules and be able to explain correct procedures to their workers.

**Recommendation #3** *Workers should wear a hard hat while in areas where there is danger from impact, or from falling or flying objects [CFR 1926.100 (a)]*

**Discussion:** These men were working in an area where metal frame construction was in process. They were clearly at risk for head injury and should have been wearing hard hat protection. A properly-fitting hard hat could have reduced severe head injury, and saved the victim's life.

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