

TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE

Case No. 2002IA030

Report Date: 31 August 2004

SUBJECT: Front Hopper Gate Operator Run Over by Chip Spreader during Street Resurfacing

SUMMARY

In the summer of 2002, a 21-year-old male road construction worker was crushed while making adjustments to a roadway resurfacing machine on a straight and level portion of street. The chip spreading machine was a 1992 model (Photo 1), and was pulling a 1984 tandem axle dump truck. Three construction workers were involved in this incident: the primary operator of the chip spreading machine; a secondary side-gate or front hopper operator (the victim); and the dump truck driver. The victim had worked with this equipment 2 previous summers.



Photo 1 – Front view of the rock-chip spreading machine, showing the hoppers for the chips, the operator's seat position, and the inherent blind spot at the right front corner of the machine.

It was the first day of road resurfacing at this worksite and everything was considered routine. The chip spreading machine was moving slowly forward on the roadway, pulling the rear-facing dump truck behind it. While the equipment was in operation, the side-gate operator (victim) got off the rock-chip spreading machine and went into an adjacent wooded area. He returned to his work station at the front right of the chip spreader and began adjusting the gate levers. Subsequently, he fell in front of the chip spreading machine and was run over first by the chip spreader and then by the left rear axle of the dump truck, at which time the dump truck became uncoupled from the chip spreader's hitch. The driver got out of his truck to investigate. He found the victim lying between the first and second sets of duals on the driver's side rear axles and move the truck forward (Photo 2). The victim died at the scene from severe head and neck injuries.

RECOMMENDATIONS based on our investigation are as follows:

1. *Employers must educate and instruct each employee in the recognition and avoidance of unsafe work conditions and applicable regulations associated with their work environment to control or eliminate any hazard(s) or other exposure to illness or injury.*
2. *When two people are required to simultaneously perform operational tasks their work must be coordinated, which requires effective communication.*
3. *Manufacturers of chip spreaders should employ engineering controls to reduce excess noise and designs that do not require an operator other than the primary operator.*

INTRODUCTION

In June 2002, a 21-year-old male construction worker from out-of-state was crushed after falling off a chip spreader distributing aggregate in the chip and seal resurfacing of an existing street. Iowa FACE was notified of this incident a few days later by the Iowa State Medical Examiner's Office. By that time, the resurfacing of the roadway was complete and all equipment had been relocated to other worksites. Information and photographs were obtained from local police. Other sources were the Iowa State Medical Examiner, interviews with co-workers, local ambulance/fire/rescue personnel, OSHA

citations, and eyewitnesses. Some involved parties were unwilling to speak with FACE investigators and certain details surrounding this incident remain unclear.

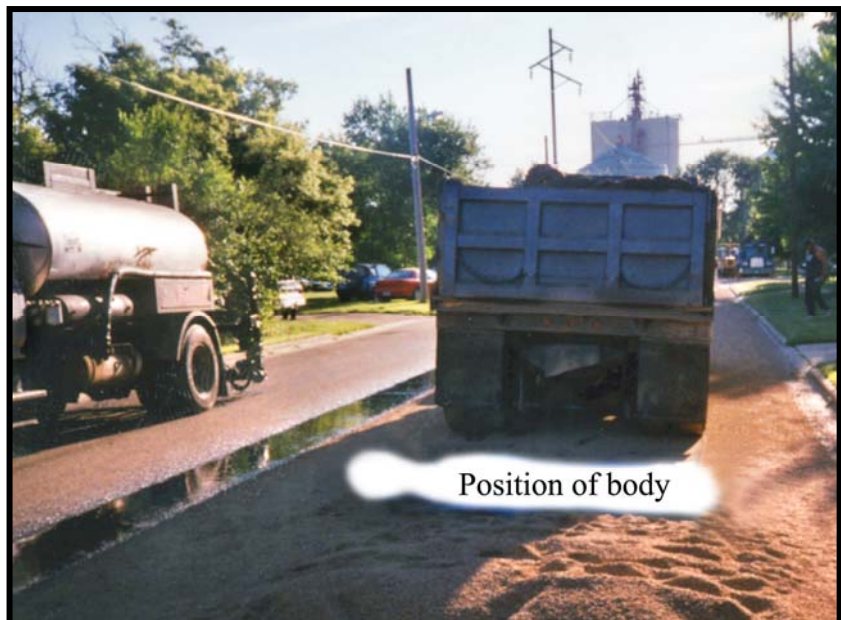


Photo 2 – Rear of the dump truck showing position of the victim's body.

The company involved in this incident is an out-of-state road resurfacing/construction company that had been in business for approximately 14 years. They specialized in seal-coating and offered this service seasonally in Iowa April through September. At the time of the incident, the company had about 30 employees working on two different road resurfacing crews at two different worksites. At the worksite where this incident occurred, 10 company employees were involved in the resurfacing project. The victim had worked for the company the previous two summers as a member of a road resurfacing crew. The primary operator of the chip spreading machine had operated it the previous construction season. The company did not have comprehensive written safety programs or policies in place at the time of this incident. Worksite-specific or "tailgate" safety meetings were held by crew supervisors roughly each

month to educate and apprise employees of safety and health issues. In addition, all new employees were given a safety walk-through that was “hands-on” by a crew supervisor. The company did not require a pre-employment physical or drug testing of its employees. It had not had any fatalities reported previously. No orange-colored safety gear or hard hats were in use at this worksite at the time of the incident.

INVESTIGATION

The company involved in this incident had been in business for approximately 14 years and its base of operation was outside Iowa. The Standard Industrial Code (SIC) for the company is 1611, Highway and Street Construction, Except Elevated Highways (Division C: Construction, and Major Group 16: Heavy Construction Other Than Building Construction Contractors).

The company specialized in resurfacing roadways using the sealcoating process, which is a surface coating applied to an existing hard surface (concrete or asphalt) roadway. The process involves the following steps: 1) removal of loose dirt and debris from roadway; 2) filling large (pot) holes in the roadway with loose rock chips/sand; 3) spray application of hot liquid asphalt/oil mixture to roadway surface; 4) application of thin coating of small rock chips to roadway surface; and 5) cold rolling the roadway surface. The types of heavy equipment utilized in this process include brooms, chippers, hot liquid asphalt/oil mixture application truck, dump trucks, chip spreader, and roller.

The incident occurred during the 4th step of the sealcoating process, and involved a 1992 chip spreading machine and a 1984 double (tandem) rear-axle dump truck. During this step the rear of the dump truck is coupled to the rear of the chip spreader. As the rock-chip spreading machine moves forward along the roadway, it spreads a thin and uniform coating of rock chips from its front hopper while it tows the rear-facing dump truck along behind (Photo 3). Aggregate in the dump truck’s hopper (or box) flows by gravity into a hopper at the rear of the chip spreading machine and is then conveyed to the front of the chip spreader where it is applied to the oil-coated road surface. In this way the rock-chip spreading machine can continue spreading a uniform, continuous layer of rock chips while repeatedly being filled by different dump trucks.



Photo 3 – View from the middle of the roadway showing the work area, with the dump truck unhooked from the rear of the rock-chip spreading machine.

The company had approximately 30 employees working on two different road resurfacing crews at two different worksites at the time of this incident. Four or five of these employees had the same duties and responsibilities as the victim. There were 10 company employees working at this jobsite, and three were involved in this incident: the primary operator of the chip spreading machine; the side-gate operator for the chip spreader (the victim); and the driver of the dump truck.

During normal operation the primary operator of the rock-chip spreading machine slowly drives forward on the roadway being resurfaced with a rear-facing dump truck in tow. The primary operator's station for this chip spreader is located at the left rear (Photo 1), resulting in a restricted view of the area to the right front of the machine. The dump truck driver remains in the truck's cab with the truck's

transmission in neutral and raises the truck's box to control the transfer of aggregate to conveyors in the rear hopper of the chip spreading machine (Photo 4). The side-gate operator for the chip spreader is responsible for controlling the uniform, final flow of rock-chips applied to the roadway. Given the high noise level of the machinery in operation, hand signals were the means of communication between the primary operator, the side-gate operator of the chip spreading machine, and the driver of the dump truck.



Photo 4 – Rear of the rock-chip spreading machine.

The victim had worked for the company two previous summer construction seasons and was considered experienced with the operation of the equipment. The primary operator of the rock-chip spreading machine had operated this equipment the previous construction season.

The weather at the worksite was clear, warm, and dry. It was the first day of road resurfacing activities at this location, and work was proceeding routinely. No previous problems had been reported with either the chip spreading machine or the dump truck involved in this incident. The area of this worksite where the incident occurred was a straight, level segment of residential street in a small community.

The primary operator of the rock-chip spreading machine was at the machine's primary operator station. The dump truck driver was in his truck's cab, with the truck's transmission in neutral, watching the side mirrors on his truck and controlling the elevation of the dump truck's box. While the coupled equipment combination was moving forward, the secondary or side gate operator (victim) got off the rock chip spreading machine and went into a wooded area along the roadway. Returning to his side-gate operator's position at the front right of the machine he began adjusting the levers to control the flow of rock-chips. One witness stated a mulberry tree was nearby and that the victim was seen eating berries one second, then under the machine the next. The victim evidently fell or slipped forward and landed in front of the chip spreading machine.

Neither the primary operator nor the dump truck driver saw the victim fall. The victim was run over by the rock chip spreading machine and then by the duals of the rear axle of the dump truck trailing the chip spreader. The dump truck unhooked from the rock chip spreading machine and stopped moving as its rear dual wheels ran over the victim. The truck driver stopped his truck, got out of its cab, and immediately saw the victim between the first and second set of rear dual wheels on the driver's side of the truck.

All work activities were immediately suspended and emergency response personnel were summoned to the worksite. Responders from the local ambulance and fire/rescue services arrived within minutes of notification. The victim was pronounced dead at the scene from severe head and neck injuries. Before the victim was removed from the scene, representatives from the local police department, Iowa State Patrol, and Iowa Department of Transportation were summoned to conduct investigations. The chip spreading machine was found to be in normal operating condition with one section of the front gate plugged by "dirty rock".

CAUSE OF DEATH

The medical examiner listed the cause of death as, "closed head injury due to motor vehicle accident". No autopsy was performed.

RECOMMENDATIONS / DISCUSSION

Recommendation #1 – *Employers must educate and instruct each employee in the recognition and avoidance of unsafe work conditions and applicable regulations associated with their work environment to control or eliminate any hazard(s) or other exposure to illness or injury.*

Discussion: It is imperative that employers educate and train employees about the types of hazards present in their work environment. Further, employers must also educate employees in the proper steps and precautions that must be taken to avoid, control, or eliminate such hazards.

Recommendation #2 – *When two people are required to simultaneously perform operational tasks their work must be coordinated, which requires effective communication.*

Discussion: Because this equipment was noisy, the only means of communication between the chip spreader primary operator, side-gate operator, and dump truck driver was hand signals. This can be appropriate in situations where constant line-of-sight is maintained, but when workers are out of view alternative means of communication (radio headset, hand-held units, etc.) should be employed.

Recommendation #3 – *Manufacturers of chip spreaders should implement engineering controls to reduce excess noise and designs that do not require an operator other than the primary operator.*

Discussion: Engineering controls should be considered to reduce excessively loud noise from this equipment, which could result in improved communication. It is also possible that slip-resistant surfacing or additional safety railings at the side-gate operator's station on this chip spreader might have

prevented the victim from slipping and/or falling. However, designs that do not require an operator in this position should be the preferred means to prevent exposure.

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Fatality Assessment and Control Evaluation

FACE

Fatality Assessment and Control Evaluation, FACE, is a program of the *National Institute for Occupational Safety and Health* (NIOSH), which is part of the *Centers for Disease Control and Prevention* of the *U.S. Department of Health and Human Services*. Nationally, the FACE program identifies traumatic deaths at work, conducts in-depth studies of select work deaths, makes recommendations for prevention, and publishes reports and alerts. The goal is to prevent occupational fatalities across the nation.

The NIOSH head office in Morgantown, West Virginia, carries out an intramural FACE case surveillance and evaluation program and also funds state-based programs in several cooperating states. In Iowa, *The University of Iowa* through its *Injury Prevention Research Center* works in conjunction with the *Iowa Department of Public Health* and its *Office of the State Medical Examiner* to conduct the Iowa FACE program.

Nationally, NIOSH combines its internal information with that from cooperating states to provide information in a variety of forms which is disseminated widely among the industries involved. NIOSH publications are available on the web at <http://www.cdc.gov/NIOSH/FACE/> and from the NIOSH (1-800-CDC-INFO (1-800-232-4636) or email cdcinfo@cdc.gov).

Iowa FACE also publishes its case studies, issues precautionary messages, and prepares articles for trade and professional publications. In addition to postings on the national NIOSH website, this information is often posted on the Iowa FACE website at <http://www.public-health.uiowa.edu/FACE/>. Copies of FACE case studies and other publications are also available by contacting Iowa FACE directly.

The Iowa FACE team includes the following specialists from the University of Iowa: Craig Zwerling, MD, PhD, MPH, Principal Investigator; John Lundell, MA, Co-Investigator; Murray Madsen, MBA, Chief Trauma Investigator; and Co-Investigator/specialists Risto Rautiainen, PhD, and Wayne Sanderson, PhD, CIH. Additional expertise is provided from the Iowa Department of Public Health, including Rita Gergely, Principal Investigator, and John Kraemer, PA, from the Office of the State Medical Examiner.

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