

October 21, 1996

Nebraska FACE Investigation 96NE035

**SUBJECT:**

Maintenance Mechanic Crushed in Machinery

**SUMMARY:**

A 44-year-old maintenance mechanic died as a result of injuries sustained when he was crushed in an angle iron processing machine. He had been performing maintenance on the machine and was tightening some bolts when the incident occurred. He was lying on a concrete floor between the main body of the machine and a moving carriage while tightening the bolts. The moving carriage crushed him between the main body of the machine and the carriage. The machine was not locked/tagged out prior to the task being performed at the time of the incident.

The Nebraska Department of Labor investigator concluded that to prevent future similar occurrences:

- \* Employers and employees must ensure that lockout/tagout procedures are followed at all times.
- \* Employers must ensure all machines have adequate machine guards installed.
- \* Employers should consider installing sensors (light, pressure, motion or floor) on automated machinery with the potential for causing serious injury or death.
- \* Employers should consider implementing a spot inspection program to ensure all employees are complying with safety requirements and enforce consequences for noncompliance.

## **PROGRAM OBJECTIVE:**

The goal of the Fatality Assessment and Control Evaluation (FACE) workplace investigation is to prevent work-related deaths or injuries in the future by a study of the working environment, the worker, the task the worker was performing, the tools the worker was using, and the role of management in controlling how these factors interact.

This report is generated and distributed **solely** for the purpose of providing current, relevant education to employers, their employees and the community on methods to prevent occupational fatalities and injuries.

## **INTRODUCTION:**

On July 30, 1996, at approximately 2:00 p.m., a 44-year-old maintenance mechanic was crushed in an angle iron processing machine, hereafter referred to as an angle processor. The Nebraska Department of Labor was notified of this fatality by OSHA on July 30, 1996. The Nebraska FACE investigator accompanied an OSHA investigator to the incident site on July 31, 1996 and then again on August 5, 1996. Interviews were conducted with the safety director and employees on site and on August 5, 1996 the angle processor was observed in operation.

The employer is a manufacturer and has been in business for 50 years. The company employs 1,350 people. This appeared to be the second fatality in the history of the company. The company has a full-time safety director and support staff. The company has a written safety program and conducts regular safety training for all employees.

## **INVESTIGATION:**

The victim, who had been employed with this company for 24 years, had been working approximately seven hours when the 2:00 p.m. incident occurred. The machine the incident occurred on is an angle iron processing machine (angle processor). This particular computer controlled angle processor takes a 40 foot length of angle iron and processes it according to the computer instructions provided. The carriage (see Figure 1) moves the angle iron through the angle processor. The first function performed on the angle iron is stamping. The iron enters a stamper, and if required, characters are stamped onto the iron. Next the iron enters a punch press

where holes are punched, as programmed by the computer. Then the iron proceeds to the shearer where it is sheared to a programmed length. After the iron is sheared, it proceeds through the processor further and is then ejected into a collection area ("finish" area). The length of time required for processing each 40 foot piece of angle iron varies according to the functions performed on it. The cycle time for each 40 foot piece at the time of the incident was approximately 5 ½ minutes.

The morning of the incident, the operator of the angle processor was experiencing problems with the stamper portion of the angle processor. The victim, who had worked on this particular piece of machinery for approximately 15 years, was called to check it out. He arrived at the angle processor a little after 7 a.m. to begin troubleshooting. He left to get some equipment and returned with a helper. The victim and the helper worked on the machine most of the day. It appeared the stamper was not level and was not stamping the angle iron properly. As part of their maintenance activities they had to lift the stamper, with a portable hoist, off the concrete floor to see if anything was under the stamper which kept it from being level. They checked things out and lowered the stamper back into place. They then had the iron processor operator run one 40 foot length of angle iron through the machine to see if it was properly adjusted. It needed some more adjustments, so they set some adjust screws and had the operator run another piece of iron through the machine. Several adjustments and test runs were accomplished during the day. After finally getting the stamper adjusted properly the victim requested the operator to run one more piece of iron through the machine. The operator gave the angle processor computer instructions to run one 40 foot length of angle iron. When the angle processor began this approximately 5 ½ minute cycle, the operator and the victim were both on the control platform of the machine. After the cycle started, the victim and the operator left the platform. The operator went to the "finish" area where the sheared pieces of angle iron are collected and the victim walked away. The operator said he was unaware the victim was going behind the iron processor where the incident occurred. It should be noted that operation of this machine does not require an operator to be at the controls while the machine is running. It is standard procedure for the operator to be in the "finish" area handling the sheared pieces of angle iron while the machine is in operation. The victim's helper was still on the control platform putting the front cover back on the stamper. The victim had told his helper he was going to tighten some bolts on the stamper. The bolts he was tightening were 1" in diameter and were the ones which bolted the stamper to the floor. The helper said at one point he saw the victim lying on the floor with his chest facing the stamper and his back facing the moving carriage. The helper

continued putting the cover on the stamper, and while doing this he could not see the victim. He heard a yell from the victim and immediately hit the emergency shutoff button which was on the iron processor control panel behind him. The helper then ran around to the back of the machine where the victim was. The carriage had traveled the full distance and crushed the victim between the carriage and the stamper. The victim was sitting and still conscious. After the victim extricated himself from between the carriage and the stamper the space was approximately 8" to 9" wide. When the carriage travels the full distance to the stamper (the actual area the victim was crushed against were some solenoids on the stamper) the space is only approximately 2" wide. While freeing himself the victim probably pushed the opening wider. The operator, who was at the "finish" area in the front of the machine, heard the helper call for help and the operator called 911. The call to 911 went in at approximately 2:20 p.m. and they were on site at 2:35 p.m. He was flown via helicopter to a major hospital where he died at 4:06 p.m.

The investigation revealed that the angle processor was not locked/tagged out prior to the maintenance being performed at the time of the incident. The company had lockout/tagout procedures and training and even covered lockout/tagout periodically at monthly safety meetings. The individuals involved in this incident had received lockout/tagout training. The company also kept a log of what machinery had been locked/tagged out and who had done it. The victim had a good record of adhering to the lockout/tagout program as evidenced by numerous entries in the lockout/tagout log. The reason why he did not lockout/tagout the iron processor this time is unknown. The angle processor operator who was on duty while the machine was being worked on said the angle processor computer indicated the machine had been completely shut down at least twice during the time it was being worked on. The computer indications showed the angle processor had been shut off at the main circuit breaker applying power to it. This circuit breaker is located several feet from the machine and is the one which should be locked/tagged out prior to maintenance.

#### **CAUSE OF DEATH:**

The cause of death as stated on the death certificate was blunt trauma to chest and abdomen.

## **RECOMMENDATIONS/DISCUSSION:**

**Recommendation #1: Employers and employees must ensure that lockout/tagout procedures are followed at all times.**

Discussion: Had lockout/tagout procedures in accordance with 29 CFR 1910.147 (c)(4)(I) been used this fatality could have been prevented.

**Recommendation #2: Employers must ensure all machines have adequate machine guards installed.**

Discussion: In this case the angle processing machine had a carriage which moved along a rail creating pinch points. The hazards include being struck by the carriage as it moves as well as being crushed by the carriage against the stamper (solenoids on the stamper) or other objects in its path. Machine guarding is required by 29 CFR 1910.212(a)(1). A protective barrier, such as a fence, running the entire length the carriage travels, would be an effective means of protection from the carriage. An access gate to the area where the incident occurred could be part of the fence. This gate should be equipped with an electrical interlock which would remove power to the carriage when it is opened.

**Recommendation #3: Employers should consider installing sensors (light, pressure, motion or floor) on automated machinery with the potential for causing serious injury or death.**

(NOTE: These measures would be used in addition to lockout/tagout procedures, **NOT** in lieu of).

Discussion: There are many available options which could enhance the safety of machines such as the angle processor in this incident. A light sensor could be installed which would direct a beam of light between the stamper and the carriage, which if broken, would stop movement of the carriage. Also a pressure switch could be installed on the carriage which could reverse the direction of the carriage if it strikes something. Again, these measures **do not** take the place of lockout/tagout procedures, they just provide an added measure of safety and could possibly prevent injuries or deaths.

**Recommendation #4: Employers should consider implementing a spot inspection program**

Discussion: To ensure safety program compliance, spot inspections by supervisors and management should be conducted regularly to verify proper procedures, such as lockout/tagout, are always followed. These spot inspections should be documented and deterrent consequences enforced when violations to procedures are detected. An effective Injury Prevention Program should instill an attitude in everyone that safety will never be compromised.

NOTE: A copy of the NIOSH ALERT "Request for Assistance in Preventing the Injury of Workers by Robots" which provides additional information, is included with this report.

**REFERENCES:**

Office of the Federal Register, National Archives and Records Administration, Code of Federal Regulations, Labor, 29 CFR 1910.147(c)(4)(I), 1995, and 29 CFR 1910.212(a)(1), 1995.

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