The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research NIOSH

Asphalt Milling Superintendent Crushed Under Asphalt Milling Machine, Virginia

FACE 9418

SUMMARY

On August 5, 1994, a 40-year-old male asphalt milling superintendent (the victim) was crushed when the asphalt milling machine he was operating overturned off a transporter (lo-boy) trailer. The victim and two co-workers had just milled a section of interstate highway and were loading the asphalt milling machine for transport from the jobsite. As the victim trammed the machine up onto the transporter, wooden ramps being used to elevate the rear end of the machine over the transporter wheels dislodged, and the machine overturned off the transporter into a roadside culvert. The victim was trapped in the operator's station and crushed as the machine rolled on top of him. One of the co-workers notified the EMS who responded immediately, followed by the medical examiner. The victim was pronounced dead at the site.

NIOSH investigators concluded that to prevent similar occurrences, employers should:

- **ensure that equipment used for loading mobile machines on transporters is configured so that precise alignment of the machine is not critical to the safety of the operation.**

In addition, equipment designers, manufacturers, and employers should:

- **consider providing control station layouts that use dissimilar-shaped control levers for differing functions, or which include control lockout devices to prevent hazards from inadvertent control activation**
- **consider machine operator visibility when developing machine designs and operational procedures.**

INTRODUCTION

On August 5, 1994, a 40-year-old male asphalt milling superintendent (the victim) died when the asphalt milling machine he had been operating overturned and crushed him. On August 11, 1994, officials of the Virginia Occupational Safety and Health Administration (VAOSHA) notified the Division of Safety Research (DSR) of the incident, and requested technical assistance. On September 27, 1994, a safety engineer and a statistician from DSR met with the VAOSHA compliance officer assigned to the case. The president and human resources director of the construction company were interviewed at the company's business office and equipment yard. The asphalt milling machine and the transporter were examined and photographed, and measurements were taken.

The employer in the incident was a highway construction company employing 120 workers, approximately 40 of whom were seasonal. The company engaged in various types of highway construction; however, asphalt milling was a specialty. The company had been in business for 34 years. The victim had 7 years of experience operating asphalt milling machines and had worked his way up from entry level to milling superintendent. He was responsible for operation of all five of the company's milling machines. The human resources director was responsible for company safety issues. In addition to weekly safety meetings, the company had a general safety program which included sending employees to attend a yearly training course at the milling machine manufacturer's facility. This training covered work procedures and safety issues. Training for task-specific procedures was received on the job. The company had also adopted the milling machine manufacturer's recommended safe operating procedures which covered transporting and hauling the equipment as well as milling operations. The company had experienced another fatality about 1 year before the incident, although it was not related to asphalt milling or equipment operation.

INVESTIGATION

The process of asphalt milling is a specialized operation which is performed in preparation for resurfacing existing asphalt roadways. The existing asphalt is removed mechanically (milled) by self-propelled machines equipped with rotating cutter drums, loaded into trucks, and transported to asphalt batch plants where it is recycled. The machine involved in the incident was capable of cutting a width of 62 feet. The machine is 44 feet long overall, 8 feet wide and 8 feet 10 inches high. Propulsion is provided by four crawler tracks, located two on each end of the machine and driven by a 400-hp diesel engine through hydrostatic transmissions. Each crawler track has its own individual hydrostatic drive motor. Rotation power for the cutter drum is derived from a power take off from the diesel engine. Depth of cut is controlled by hydraulically adjusting the height of the machine chassis over the crawlers and is typically maintained at 23 inches during milling operations.

At 7 p.m. on August 5, 1994, a milling crew consisting of a foreman/groundman, a groundman, and a milling machine operator began milling operations along a stretch of interstate highway. They had completed all but one pass of the night's assignment when the machine operator quit and left the jobsite due to a conflict with the foreman over company safety policy.

At about 12:30 a.m., the foreman telephoned the victim and notified him that the machine operator had quit and that the job was one pass from completion. The victim told the foreman that he would come to the jobsite and operate the machine to finish the job. The victim then proceeded to the jobsite, arriving between 1 and 1:30 a.m., where he operated the milling machine, completing the job.

Shortly before 2:45 a.m. the crew began to load the milling machine onto a transporter (lo-boy) for removal from the jobsite. The transporter had been parked on the asphalt shoulder of the highway between the edge of the roadway and a culvert. Because of the length of the milling machine, the rear tracks are normally positioned over the axles of the transporter for transport while the discharge conveyor is over the cab of the transporter's tractor. Positioning the milling machine in this manner requires that ramps be used to enable the machine to negotiate the transition from the transporter's deck in front of its wheels to the deck over the transporter wheels. To accomplish this, the crew placed two wedge-shaped wooden blocks (12- by 12- by 52-inch) in front of the deck transition (Figure 1). The victim began to tram the machine in reverse onto the transporter with the assistance of his co-workers, one positioned on the ground between the transporter and the edge of the roadway and the other positioned behind and to the culvert side of the trailer. The victim had moved the machine onto the transporter and the rear tracks were partially up on the wooden ramps. At that time, the co-worker standing between the transporter and the edge of the highway signaled to the victim that the machine was too high and that it should be lowered closer to the tracks. The other co-worker observed that the rear tracks were too far to the right, moved forward to notify the victim, and then returned to the rear of the transporter. At that time, either the rear of the milling machine slipped off the ramps, or the ramps themselves dislodged from under the tracks, and the machine overturned off the transporter. The co-workers immediately began searching the area for the victim and found him pinned under the milling machine at the operator's station. One co-worker left the scene and notified the local EMS by mobile telephone while the other checked the victim's pulse, finding none. The EMS responded approximately 15 minutes after notification, followed by the medical examiner, who pronounced the victim dead at the site.

CAUSE OF DEATH

The medical examiner determined the cause of death to be crush injuries to the chest.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that equipment used for loading mobile machines is configured so that precise alignment of the machine is not critical to the safety of the operation.

Discussion: The tapered wooden blocks used as ramps to ease the machine up over the rear wheels of the transporter depended on the friction force between the deck surface and the underside of the blocks to keep them in place. Additionally, the width of the blocks was the same as the width of the machine's tracks. Although this standard loading procedure had been used without incident by the company in the past, it allowed little or no room for error in steering the machine up and over the ramps. If the machine was not centered over the ramps, the blocks could roll or kick out from under the crawler tracks (Figure 2). The employer in this incident has initiated design changes to the equipment used for transporting the milling machines. Transporter decks have been modified by the addition of a permanent ramp constructed from structural steel members (Figure 3). This ramp extends across the entire 7-foot 11-inch-wide transporter deck. Because the ramp covers the full width of the transporter deck, precise steering of the milling machine as it trams onto the ramp is less critical. Also, since the ramp is a permanent part of the transporter deck, in addition to extending the full width, instability is no longer a factor.

Recommendation #2: Equipment designers and manufacturers should consider providing control station layouts that use dissimilar- shaped control levers for differing functions, or which include control lockout devices to prevent hazards caused by inadvertent control activation.

Discussion: During loading operations, it was standard procedure for the machine operator to keep the height of the milling machine as low as possible. This procedure was intended to ensure the stability of the machine by maintaining a low center of gravity, placing the cutting drum as close as possible to the transporter deck so that if the machine did start to overturn, the cutting drum would contact the deck and support the machine. Evaluation of the control layout at the operator's station indicated that the lever the victim would have pushed downward to lower the machine over the rear crawler tracks was located adjacent to the control for the discharge conveyor swing. A downward movement of the conveyor swing control lever moves the conveyor to the right, the direction in which the machine overturned during the incident. The possibility exists that the victim, in attempting to lower the machine according to his co-workers' instructions, may have inadvertently pushed down on the conveyor swing lever. If the rear tracks were already somewhat off center in relation to the ramps, the additional weight transferred to the right side of the machine due to the swinging movement of the conveyor may have increased the instability of the ramps, causing them to kick out.

Consideration should be given to relocating the conveyor swing control or shaping the lever differently from adjacent levers. A third alternative would be to provide a mechanical lockout device which can be used to disable the conveyor swing control during loading procedures.

Recommendation #3: Equipment designers, manufacturers, and employers should consider machine operator visibility when developing machine designs and operational procedures.

Discussion: The visibility from the operator's station on the milling machine was such that the crawler tracks could not be seen by the operator. In addition, the operating speed of the machine is such that the operator may not quickly receive feedback from steering control input, making it necessary for ground observers to visually assist in loading the machine on transporters. Moreover, the incident occurred during early morning darkness which could further compound visibility problems for both the operator and ground observers. Although automotive-type lights were mounted on each end of the machine, and the victim's co-workers did notice steering misalignment, additional lighting may have enhanced the ability of the observers to detect steering misalignment in time to avoid problems. At the time of the site visit, the employer was mounting halogen flood lights on the ends of the machine to augment the existing lighting system.

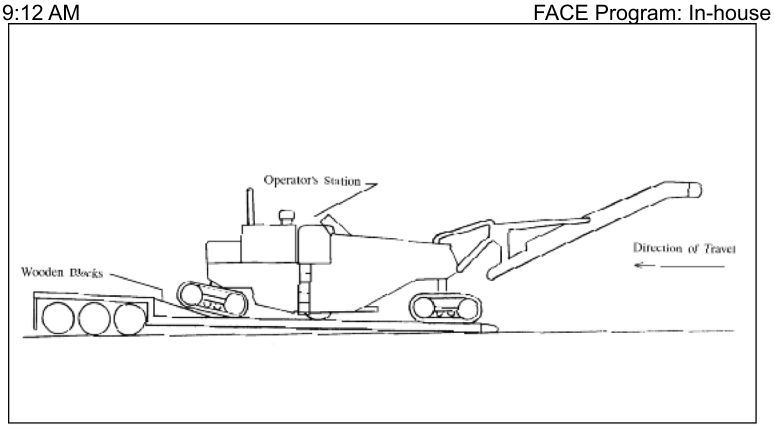

Figure 1. Asphalt Milling Machine and Transporter

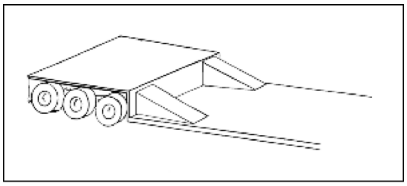

Figure 2. Configuration of Transporter Deck at Time of Incident

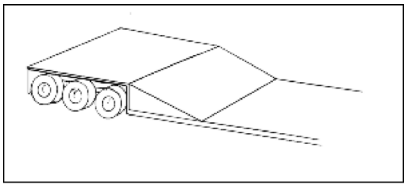

Figure 3. Configuration of Transporter Deck After Employer Modification

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Last Reviewed: November 18, 2015