ADMINISTRATIVE REPORT **DATE: July 22, 1997**
PUBLIC HEALTH SERVICE/CDC/NIOSH/DSR
FACE 97-11

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

FROM: **Division of Safety Research, NIOSH**

SUBJECT: **Construction Laborer Dies After Being Struck by a Front End Loader at a Construction Site - Pennsylvania**

SUMMARY

On June 10, 1997 at approximately 11:00 a.m., a 20-year old male construction worker (the victim) was struck by a Caterpillar Model 966 D front end loader at a construction site and died 13 hours later. The victim was collecting manifests and directing the traffic flow for incoming trucks, which were unloading stone and sand at a concrete batch plant. After directing a dump truck to unload its load of sand, the victim was struck by the left rear of the front end loader as it was backing from the ramp leading to the sand and gravel hoppers. The front end loader backed over the victim with the left rear tire, which caused severe thoracic injuries that resulted in the victim's death. At the time of the incident, the backup alarm and front horn on the front end loader were not operational. NIOSH investigators concluded that, to prevent similar occurrences, employers should:

- *ensure that backup alarms, horns, and other safety equipment are functional and tested daily on construction equipment on construction equipment which is so equipped. Equipment that has nonfunctioning backup alarms, horns, or other safety equipment should be removed from service until it is repaired*

- *ensure that construction workers who are directing traffic flow are placed in a location where they are visible to equipment and vehicle operators. The site layout should be designed for efficient and orderly traffic flow and with personnel safety in mind. Site-specific traffic control procedures should be designed and implemented to allow for construction-site traffic and safe personnel mobility*

INTRODUCTION

On June 10, 1997 at approximately 11:00 a.m., a 20-year old male construction worker was collecting shipping manifests and directing the traffic flow for incoming trucks which were unloading stone and sand at a concrete batch plant. After directing a dump truck to unload its load of sand, the victim was struck by the left rear of the front end loader as it was backing from the ramp leading to the sand and gravel hoppers (see Figure). The front end loader backed over the victim with the left rear tire, which caused severe thoracic injuries that resulted in the victim's death.

On June 12, 1997, officials of the Pennsylvania office of the Occupational Safety and Health Administration (OSHA) notified the Division of Safety Research (DSR) of the incident. On June 18, 1997, a DSR safety engineer and safety specialist reviewed the case with OSHA officials and conducted an on-site investigation. During the investigation, the site controller, superintendent, and foreman were interviewed and photographs of the incident site were taken. The batch plant where the incident occurred was operated by a private contractor and had been operational since May 20, 1997. The contractor had been in business for more than 20 years and currently employed approximately 50 union employees on the site where the incident occurred. The site superintendent was responsible for safe plant operation and insuring the competency of the employees. The victim was assigned duties of collecting shipping manifests from incoming gravel and sand trucks and directing each truck to the dump site. The victim had worked on-site for approximately 15 days, 8 days of which he was assigned to collect the manifests and direct incoming traffic. This was the first fatality for this contractor's field operations.

The contractor provided a written safety manual to all the site employees for them to read and sign but relied on the union to provide safety training for its members. The contractor did not confirm if the trade union was providing appropriate safety training to its members. The contractor monitored the work practices of the employees during site operations and disciplined employees if any safety infractions occurred. The victim had read and signed the safety manual provided by the contractor, although on June 3, 1997, the victim had been bumped by a bulldozer on site and was cautioned about being alert on the job.

INVESTIGATION

The incident occurred at a concrete batch plant facility which was operated by a private contractor. This facility accepted shipments, by truck of sand and stone, which were used to produce

concrete. The entrance to the facility included separate sand and stone bays, and a hopper to mix the raw materials and transport them via conveyor belt to a large mixing tank, to produce the concrete. The concrete is then shipped via truck to an interstate highway construction site nearby.

The area of the facility used for incoming shipments consisted of a 100 foot by 110 foot sand bay and a 130 foot by 130 foot stone bay separated by a 25-foot wide mixing hopper. The maneuvering area in front of the hopper and raw material bays was approximately 240-foot wide by 130-foot deep. An employee was stationed at the entrance to the facility to collect the shipping manifests from each incoming truck. The employee then directed each truck to a raw material bay to dump its load of either sand or stone. A front end loader was used to move the raw material from the bays to the mixing hopper. A 40-foot wide by 48-foot deep earthen ramp was constructed in front of the hopper for use by the front end loader. The remaining area, for the incoming trucks to maneuver, was approximately 240-foot wide by 60-foot deep.

On the day of the incident, the victim started work at approximately 7:00 a.m. and was assigned to collect shipping manifests and direct incoming trucks to dump their loads in the sand and stone bays. At approximately 11:30 a.m., the victim directed a truck into the sand bay, located to the left of the mixing hopper. The truck was dumping its load of sand into the bay when the victim walked behind the toe (bottom) of the earthen ramp, which was located in front of the mixing hopper. A Model 966D Caterpillar front end loader was backing down the earthen ramp and struck the victim approximately 24 feet from the toe of the ramp with the left rear tire, and backed over the victim. The victim was wearing an orange reflective safety vest at the time of the incident. A Pennsylvania Department of Transportation official (PennDot), who was standing near the victim's car (reference figure) witnessed the incident and motioned to the operator of the front end loader. With the exception of the front end loader operator, other site personnel were not in the immediate area. Emergency Medical Service personnel (EMS) were contacted and arrived on the scene within minutes and administered first aid. The victim died approximately 13 hours later in an area hospital.

The front end loader involved in the incident was removed from service pending an investigation. Subsequent investigation by site personnel and OSHA officials revealed the backup alarm and horn on the 966D front end loader involved in the accident were not functioning on the day of the incident.

CAUSE OF DEATH

The autopsy report listed the cause of death as "Multiple blunt force trauma."

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employees should ensure that backup alarms, horns, and other safety equipment are functional and tested daily on construction equipment which is so equipped. Equipment that has nonfunctioning backup alarms, horns, or other safety equipment should be removed from service until it is repaired.

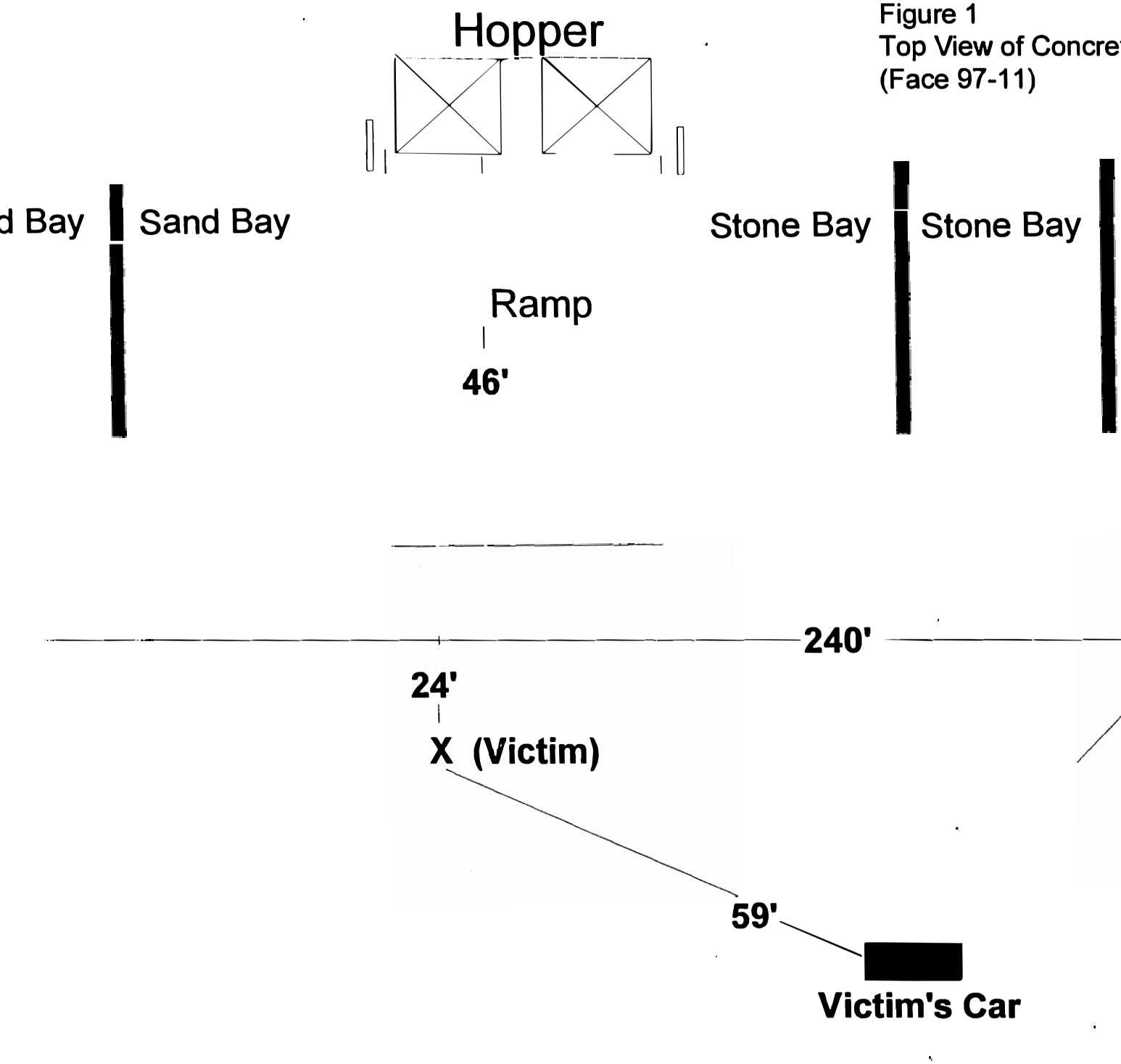
Discussion: The front end loader involved in this incident was equipped with an audible front horn and backup alarm. The backup alarm was activated when the machine's transmission was shifted into reverse. According to the superintendent, the backup alarm was functioning 2 weeks prior to the incident, but was not functioning when tested on the day of the incident. When it was tested after the incident, it also failed to operate. The front horn was also not operating prior to the incident. The horn and backup alarm were repaired after the incident on June 10, 1997. A faulty wire was the cause of the backup alarm malfunction and the front horn was replaced. The private contractor did not have any records of maintenance on the 966D front end loader, although it had been owned by the company since February 1988. The private contractor did not have a preventative maintenance program in place to maintain or document maintenance and repair performed on their equipment. Audible alarms and functional horns can provide warning when mobile equipment is moving, to alert pedestrians, even if out of sight of the equipment, allowing time for retreat from the path of the vehicle. This is especially important in congested work environments where more than one vehicle is in operation.

Recommendation #2: Employees should ensure that construction workers who are directing traffic flow are placed in a location where they are visible to equipment and vehicle operators. The site layout should be designed for efficient and orderly traffic flow, and with personnel safety in mind. Site-specific traffic control procedures should be designed and implemented to allow for construction-site traffic and safe personnel mobility.

Discussion: The procedure for routing incoming trucks at the batch plant required that an employee direct movement of the trucks while being in the maneuvering area of the vehicles. The maneuvering area

at the site was also inadequate for the number and size of vehicles which used the area, which further exacerbated the problem of safe pedestrian mobility. Since the batch plant is only a temporary site, installation of sophisticated traffic control equipment such as electrical lights and directional signals is not economically prudent. Traffic flow at a construction site should be designed prior to the start of operations, if possible, to minimize vehicular and pedestrian traffic interface. Personnel should be placed in a visible and stationary position, if possible, to direct traffic and conduct other duties. After the incident, the new person assigned to collect manifests was moved to the site exit ramp which was decided by site management to be a safer and more stationary location . If personnel mobility is necessary, then safe avenues (roped off areas, etc.) for pedestrian traffic should be provided, which do not interact with vehicular traffic.

Figure 1
Top View of Concrete Batc
(Face 97-11)



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Fatality Assessment and Control Evaluation (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when a participating State reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

States participating in this study: North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia.

Additional information regarding this report is available from:

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FACE 97-11