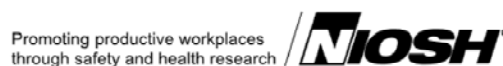




The National Institute for Occupational Safety and Health (NIOSH)



Roll-off Box Truck Driver Dies After Being Pinned Between Hydraulic Ram and Hydraulic Reservoir Tank

MN FACE Investigation 03MN016

Date: December 2, 2003

SUMMARY

A 47-year-old male waste material truck driver (victim) died after he was pinned between a hydraulic ram and a hydraulic reservoir tank. The truck was designed to carry a steel open top box that could be dropped off at a desired location.

The victim arrived at a site to drop-off an empty container and pick-up a full container. He backed the truck into the home's driveway and dropped the empty roll-off box near the full container. After placing the empty container in the driveway the homeowner gave the victim a payment check, talked to the victim for a few minutes and then went back inside his house.

The victim entered the truck and drove it forward with the rails on which the containers slid still elevated. After driving into the street and moving to the left he backed the truck into the driveway until the rails contacted the full container. He exited the cab and apparently noticed a leak in a hose to one of the hydraulic cylinders that raise and lower the rails. He stepped to a hydraulic reservoir tank located behind the cab and reached behind it with his right hand to close a hydraulic shut-off valve. While he reached to close the valve the rails lowered and he was pinned between a hydraulic ram and the edge of the reservoir tank.

About 5-10 minutes after the homeowner had talked to the victim he noticed the truck was still in the driveway. He went outside and discovered the driver pinned against the hydraulic tank. He returned to the house and told his wife to call emergency personnel. Rescue personnel arrived a short time later, removed the victim and pronounced him dead at the scene. MN FACE investigators concluded that in order to reduce the likelihood of similar occurrences, the following guidelines should be followed:

- employers should emphasize during safety training that employees should never approach a machine that has experienced any type of failure until an assessment has been done by a qualified person to insure that workers can safely approach it; and
- machine and equipment manufacturers should ensure that all operating controls and devices are located in areas that workers can access without having to place themselves in a hazardous position.

INTRODUCTION

On May 13, 2003, MN FACE investigators were notified of a work-related fatality that occurred on May 12, 2003. The county sheriff's department was contacted and a copy of their report of the incident was obtained. An investigation was conducted by a MN FACE investigator on October 13, 2003 during which district and local safety and site personnel of the employer were interviewed. During MN FACE investigations, incident information is obtained from a variety of sources such as law enforcement agencies, county coroners and medical examiners, employers, coworkers and family members.

The victim was a waste disposal roll-off-box truck driver who had been employed by his current employer for nine years. He was assigned to a specific truck that he drove each day unless a mechanical problem on the truck required that it be taken out of service until the problem was repaired.

The victim's employer is a large waste service and disposal company. The company is owned by a national parent company that creates an alliance of hundreds of companies throughout the United States. This large network of companies provides a variety of waste services that include waste collection, transfer, disposal and recycling. These services are provided to industrial and commercial customers and are also provided to millions of residential household customers. Company organization begins at the national level and is then broken down into eight regions. Each region is divided into districts which are headquartered in major metropolitan areas. Districts may include smaller "local" offices that are located in small to mid-sized cities throughout each district. These local offices report to their district office and operate in accordance with all established company policies, practices and procedures.

This incident involved an employee of a local office that employed thirty people of which twenty-four were truck drivers. The local office had a site manager however it did not have a dedicated safety manager. Instead, the local site manager worked directly with the district safety manager concerning all safety issues. The local office owned twenty-five trucks, of which four were trucks designed to carry, deliver and pick up roll-off-boxes at requested locations.

The employer has a complete and comprehensive written safety program that includes both formal and hands on training. This extensive program has been developed, maintained and is continually updated in an effort to insure that it remains in total compliance with all government established safety regulations and standards.

Prior to the MNFACE investigation of this incident, the parent company had developed a two-page safety alert concerning the circumstances of the incident. This is done for all serious violations of established safety practices and procedures that result in injury. Safety alerts contain a brief description of the incident including pictures of the equipment and a list of recommended injury prevention practices. They are distributed to all managers and supervisors and are posted in the appropriate operations areas such as driver's rooms. Each safety alert is presented and discussed with all appropriate employees within one week of its release. Supervisors review appropriate safety alerts with new employees as part of their initial training. Each safety alert includes a sheet that identifies various management responsibilities and actions concerning the alert. These include discussion points that supervisors must review with appropriate employees and suggestions for district and local supervisors to evaluate their operations for the existence of similar hazards. The alerts also include actions to be taken to prevent the occurrence of a similar incident.

INVESTIGATION

On the day of the incident, the victim began his day by completing a one page Driver's Vehicle Condition Report (VCR) form. Each driver must, in accordance with Department of Transportation regulations, complete, sign and file this form every day before beginning their pick up routes. The form is a checklist which is divided into the following three sections: fluid levels, cab inspections and visual body walk-around. It also includes several fill-in fields at the top of the form to identify a specific truck, the site location, the engine hours, the truck mileage, the date and the driver's name. The purpose of this form is to ensure that vehicles and all vehicle systems are in proper working condition before the vehicle is used each day.

The fluid levels section provides an area for the driver to indicate the amount of fuel, engine oil, transmission oil, hydraulic oil, and engine coolant added to the vehicle. The cab inspections section requires the driver to verify the working condition of all gauges, safety devices such as seat belts, service and parking brakes, cab and back-up horn, and hydraulic controls. In addition, the driver must inspect the windshield and windshield wipers, reflective safety triangles, the trucks heater/defroster and the license/registration papers.

The visual body walk-around section requires the driver to walk around the truck and visual inspect it for conditions that need service or maintenance. Areas and items inspected include the truck body and cab for physical damage, head lights, brake lights and turn signals, fire extinguisher, vehicle suspension, safety interlocks and electrical wiring. In addition, the driver must visual check air lines and hydraulic hoses for leaks and fuel tanks and fuel lines for possible problems. If the driver finds any conditions that need service or repair, the driver must indicate the problem on the VCR form and have the condition repaired before the truck can be driven and used for daily pick up of waste.

After inspecting his truck and completing the VCR form, the victim left the waste facility site with his truck which was purchased new in 2001. The truck was designed to carry a single large steel open top box that could be dropped off at a customer's desired location. While at a site, the box served as a collection container for acceptable waste and disposal material. These types of units are often used at sites such as construction sites where large amounts of waste debris and unusable materials are created and in need of disposal.

At about 9:00 a.m. the victim arrived at a residential home to drop-off an empty container and pick up a full container that was located in the driveway of the house. When he arrived, the homeowner came outside and told the victim to place the empty container in the driveway along side the full container that was being picked up. The driver backed the truck into the driveway of the house and dropped the empty roll-off box in the driveway along side a full drop-off container. The dropping of the empty container was accomplished almost entirely from inside the cab. After engaging the power-take-off (PTO) drive to operate the truck's hydraulic system, the victim activated the hydraulic system which via two large hydraulic rams or cylinders raised two steel rails that the container box rested on. The rails were raised to about a 45-50 degree angle. As the rails were raised, a cable was simultaneously released which allowed the box to slide down the rails until the back end of the box contacted the driveway. The victim then drove the truck forward and allowed the front of the box to slide down the rails and onto the driveway. He then stopped the truck and exited it to unhook a cable attached to the front of the empty container. At this time, the homeowner gave the victim a payment check for the empty box that was being delivered. After talking to the victim for a few minutes, the homeowner went back inside of the house.

The victim then entered the cab of the truck and drove it forward into the street with the rails still elevated. Drivers normally do not lower the rails if they only need to move a truck a short distance to pick-up another container. After driving into the street and moving to the left about 10-12 feet, he backed the truck into the driveway until the lowered end of the rails contacted the front of the full roll-off container. While in the cab he apparently disengaged the PTO. The PTO was found turned-off when the scene was investigated by company officials.

After he backed the truck up to the full container, he exited the cab and noticed a hydraulic leak in a hose to one of the large hydraulic cylinders that raised and lowered the rails. The leak developed after he drove the truck away from the empty container and apparently while he backed it to the front of the full container. The leak apparently developed during this short period of time since a photo of the driveway and street area directly in front of the empty container did not show any spilled hydraulic fluid on the ground.

The victim stepped to a hydraulic reservoir tank located a short distance behind the truck cab. The tank was mounted along the side of the truck frame with the top of the rectangular tank slightly below the top edge of the truck frame. The tank was also mounted such that there was only a few inches of space between the back side of the tank and the truck frame. This space was nearly completely filled by the hydraulic ram on the left side of the truck when the rails were lowered to their horizontal position. However, when the rails were elevated, there was about 5-7 inches of space between the tank and the frame of the truck due to the vertical movement of the front end of the cylinder as the rails were lifted.

Also located behind the tank and near the bottom of it was a shut-off valve in the line where oil flowed to and from the tank. The shut-off valve was a simple in-line valve that could be opened and closed by rotating a lever type handle one-quarter of a turn either clockwise or counter-clockwise. The victim may have thought that by closing the valve, the flow of oil from the ruptured hose would decrease or stop. He positioned himself at the back of the tank, facing toward the front of the truck and reached down with his right hand to close the shut-off valve. While he reached to close the valve, the rails lowered due to a loss of pressure in the hydraulic system as oil flowed from the broken hose. When the rails lowered, the victim was pinned against the top inside edge of the reservoir tank by the end of the hydraulic cylinder as it returned to its lowered position and sustained fatal crush injuries to his chest.

About 5-10 minutes after the homeowner had talked to the victim, he looked out a window of his house and noticed the truck was still in the driveway. He went out to determine why the victim had not left and discovered him pinned against the hydraulic tank. He returned to the house and told his wife to call emergency personnel who arrived within a few minutes. While waiting for emergency personnel, the homeowner's wife who is a nurse checked the victim for vital signs but found none. After rescue personnel arrived, they removed the victim and pronounced him dead at the scene.

CAUSE OF DEATH

The cause of death listed on the death certificate was asphyxia due to external thoracic compression due to an industrial accident.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should emphasize during safety training that employees should never approach a machine that has experienced any type of failure until an assessment has been done by a qualified person to insure that workers can safely approach it.

Discussion: When a component of a machine fails, workers may be exposed to additional risks or hazards that could result in serious injury or death. In addition to the normal hazards associated with the operation of machines and equipment, an equipment failure may result in workers being exposed to additional hazards such as flying debris or the uncontrolled movement of machine components. In this incident, when the hydraulic hose ruptured, the safe movement of the rails and the hydraulic rams themselves could not be controlled by the truck's hydraulic system or by the actions of the victim. In addition, since the truck's PTO system was stopped, apparently when the driver noticed the leak, control of the position and movement of the rails and hydraulic rams may have been further compromised due to the hydraulic system no longer replacing the fluid that flowed from the broken hose. These factors combined to create a situation where control of the elevated components of the truck had been lost and resulted in hazardous conditions that did not normally exist. If the driver had been trained to assess the situation for unexpected hazards or to contact a qualified person to assess the situation before he attempted to close the hydraulic valve in the flow line, he may not have entered the area he did while the rails were still elevated and this fatality might have been prevented.

Recommendation #2: Machine and equipment manufacturers should ensure that all operating controls and devices are located in areas that workers can access without having to place themselves in a hazardous position.

Discussion: Many modern machines are designed and manufactured with inherent safety features to provide a safe work environment for workers, in particular with regard to normal operation of the machine. However, when a failure occurs as did in this incident, a natural human tendency may often be to try to intervene in such a manner so as to minimize or prevent further damage. In this case, the victim may have tried to stop the flow of hydraulic oil from the ruptured hose by attempting to close a shut off valve in the fluid line leading from the reservoir tank. The location of the valve required him to position himself under an elevated machine component that was no longer adequately or safely controlled by the hydraulic system. This situation might have been avoided if the hydraulic flow line and the shut off valve had been

originally designed such that the valve could be safely accessed from a position along the outside perimeter of the truck. If the valve had been accessible from a position that did not require the victim to enter an area where elevated components existed, this fatality might have been prevented.

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