Overhead Door Mechanic Dies After Falling 16 Feet From A Ladder

DATE: August 18, 1992

SUMMARY

On April 1, 1992, a 30 year old male overhead door mechanic was critically injured while repairing an overhead door in an automotive service garage. The incident occurred while the victim was working on a ladder to service the torsion spring assembly that counterbalanced the weight of the door. As he was working on the bolts that attached the center plate of the assembly to the wall, the plate detached and spun explosively under the tension of the torsion springs. The center plate struck the victim in the head, knocking him from the ladder and causing him to fall 16 feet to the floor. The victim died of his injuries three days later. NJDOH FACE investigators concluded that, in order to prevent similar incidents in the future, employers should follow these safety guidelines:

- **Insure that the mechanical energy of spring loaded mechanisms is safely discharged before servicing the device.**
- **Require the use of hand tools for tightening or loosening bolts in critical applications.**

In addition, manufacturers of torsion spring assembly doors should:

- **Design an improved method for securing the center plate of the torsion spring mechanism to the wall.**

INTRODUCTION

On April 24, 1992, NJDOH FACE personnel were informed by the county medical examiner of a worker who died of injuries suffered in a work-related incident. FACE investigators informed the area OSHA office of the incident and visited the site on April 29, 1992. (OSHA did not investigate the incident as the victim was the sole proprietor of the company and not within OSHA's jurisdiction). The site investigation included photographing the scene and interviewing the site owner and a witness. Additional information was obtained from the police report and medical examiner's office. The manufacturer was unable to provide any information on the door.

The victim was a 30 year-old male overhead door mechanic who was the owner and only employee of a company that installed and serviced overhead garage doors. The victim took over the company in 1986 from his father who had started the business in 1970. Although he was the only employee at the time of the incident, the victim sometimes hired a second employee to help him.

INVESTIGATION

The incident occurred at an automotive service garage located in a rural area. The owner of the garage had contracted with the victim to repair three overhead bay doors which had become difficult to open. All three doors were manually operated torsion spring assembly doors which had been installed four years previously when the garage was built. This type of design uses two large coiled springs mounted directly over the door to counter balance the weight of the door (see diagram). Both springs are mounted horizontally on a metal shaft and joined together with a metal support at the center of the mechanism. This metal support is attached with two large lag bolts to a wooden board that is affixed with metal brackets to the wall. The twisting tension of the each spring turns a cable reel mounted at the end of the mechanism. The reels retract the metal cables which provide the counter balance to the door.

On the day of the incident, the victim arrived at the garage at 3:45 p.m. and started work on the doors. Working alone and using his own fiberglass extension ladder, he quickly adjusted the first two doors and began work on the third. The employees of the garage noted that he seemed to be very experienced with the doors and were impressed by how easily the newly adjusted doors opened. After completing work on the third door, the victim was last seen standing on the floor, pulling on a cord to raise the door while looking up at the spring mechanism. He closed the door and moved his ladder to the center of the spring mechanism and was apparently working on it when the metal support detached from it's wooden mounting. The springs unwound explosively, spinning the metal support and striking the victim on the head and hand. The victim fell backwards from the ladder, falling 16 feet and hitting the roof of a car in the garage before landing on the concrete floor.

An employee of the garage heard the loud noise and turned his head to see the victim falling head first to the floor. A second employee immediately called 911 and went to help the victim. Seeing the severity of his injuries, he called 911 a second time and tried to assist the victim, who appeared to be semi-conscious. A responding member of the rescue squad arrived first and requested a med-evac helicopter on a portable radio. About 20 minutes after the first call, the rescue squad ambulance arrived accompanied by several paramedic units. The victim was moved into an ambulance and taken to a nearby field where he was airlifted to the regional trauma center. He died at the trauma center three days later.

Although he did not see the events leading to the incident, one witness noted that he found the victim with an electric drill lying on his stomach and the cord wrapped around his arm. The drill had a half-inch socket attached which corresponded to the half-inch boltheads on the lag bolts attaching the metal support to the wooden board. This suggests that the victim was working on these bolts when the support detached. FACE investigators were not able to view the drill or spring assembly but interviewed the company that replaced the mechanism after the incident. The company representative stated that the lag bolts had not been overdriven into the board; overdriving would snap off the bolt heads which did not happen in this incident. The injuries to the victim's right hand suggest that he may have been holding his hand on or near the support when it detached from the wall.

CAUSE OF DEATH

The county medical examiner attributed the cause of death to a blunt injury to the head. Extensive injuries to the right hand were also noted. An autopsy was not conducted in this case.

RECOMMENDATIONS AND DISCUSSION

Recommendation #1: Employers should insure that the mechanical energy of spring loaded mechanisms is safely discharged or contained before servicing the device.

Discussion: In this case, the victim appeared to have switched from tightening the springs of the torsion spring assembly to servicing the bolts on the center plate of the mechanism. This plate was under tremendous pressure from the springs, leading them to unwind explosively when the plate was released. It is imperative that any mechanical energy stored in the springs is first safely released before any work is done on the mechanism. If this is not possible, the energy should then be contained or blocked from uncontrolled discharging.

Recommendation #2: Employers should require the use of hand tools for tightening or loosening bolts in critical applications.

Discussion: It appears that the victim was using a hand-held electric drill to drive the lag bolts that attached the center plate to the wooden mounting board. Although it is not known exactly how this contributed to the incident, it is possible that the power of the tool may have been a factor. The use of power tools in this manner can overdrive bolts, possibly stripping the wood or breaking off the bolt head. It is also possible that the drill may have been inadvertently set in reverse, loosening the bolt instead of tightening it. To prevent this, employers should require hand tools (or power tools specifically designed for the task) for driving lag or other bolts that are critical to the safe function of the device.

Recommendation #3: Manufacturers of torsion spring assembly doors should design an improved method for securing the center plate of the spring mechanism to the wall.

Discussion: It is apparent that the design of this door places tremendous torque on the center plate of the mechanism and the two lag bolts that attach it to the wall. Although this may be sufficient to hold the mechanism, it is recommended that the attachment should be improved to better secure the plate to the wall. A suggestion may be to use machine bolts with nuts instead of lag bolts to attach the center plate to the wall. Adding a third bolt to the two existing bolts on the plate would also increase security.

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