MIFACE Investigation Report: #14MI002

Subject: Loader Operator Died When He Fell Into a Railcar Compartment and Was Engulfed by 70,000 Pounds of Yellow Soybeans During Loading.

Summary

In winter 2014, a loader operator in his 30s died when he fell into a railcar hopper and was engulfed by 70,000 pounds of yellow soybeans during loading (Figure 1). The switch operator in the yard positioned a string of railcars into the load out area. The incident railcar had three compartments with four hinged lids that opened toward the load out room. The load out room was positioned above and to the west of the railcars. To access the railcars from the load out room, two 4-5 foot long steps approximately 18 feet above the ground were winched down to just above the railcar. The unwitnessed incident occurred during the loading of the next to last railcar. To access the top of the railcars, the decedent opened the load out room door and then stepped onto the top step. He did not attach the fall arrest lanyard that was hooked to the outside wall of the load out room to his fall harness. The weather was windy with a sub-zero wind chill. It is most likely that the decedent slipped or tripped, either while descending the steps or walking along the top of the railcar. He fell into a 13-foot-long by 2-foot-wide hatch opening of the railcar. Coworkers noted that a weigh hopper had not been emptied and investigated. One worker called for emergency response as they were looking for him. Knowing which compartment was last filled they walked around the railcar and then began unloading the compartment from the bottom of the railcar. They found the decedent and pulled him from the compartment. CPR and defibrillation were given but he could not be revived and was declared dead at the scene.

Figure 1. Open hatch of similar railcar compartment

Key contributing factors identified in this investigation include:

- Did not hook to fall arrest cable
- Subzero weather with high winds
- Nonslip footwear not worn
- Access procedure to top of railcar
- Unprotected open lid
- Non-serrated step surface

- Working alone on the railcar without a “spotter”

RECOMMENDATIONS

- Install grating on the railcar compartment to allow product loading but prevent a fall into the open hatch.
- Access to the railcar should be retrofitted to minimize slips and falls.
- Ensure compliance with fall protection policies and procedures.
- Monitor weather conditions to schedule loading/unloading activities during the best possible (least hazardous) weather.
- Require non-slip footwear for the loader operation.
- The railcar loading operation should be a 2-person operation; one person (operator) to access the top of the railcars and perform the required tasks and the second person should act as a spotter to ensure the safety of the loading operator.

BACKGROUND

In winter 2014, a loader operator in his 30s died when he fell into a railcar hopper and was engulfed by 70,000 pounds of yellow soybeans during loading. MIFACE learned of this incident from the MIOSHA 24-hour ASAP reporting system. MIFACE contacted the corporate safety director for the company, who agreed to speak with the MIFACE investigator about the incident as well as share pictures taken at the time of the incident. During the writing of this report, the death certificate, police and medical examiner reports, and the MIOSHA compliance file were reviewed. The pictures used in this report are courtesy of the MIOSHA compliance file and the corporate safety director.

The employer has been in business for more than 60 years and had more than 40 grain storage facilities in multiple states. The incident site was one of their older facilities that processed corn and soybeans. The decedent had worked full-time for the company for 8 months. He was classified as an “entry-level” employee.

The safety director had 29 years with the company and reported to the vice president of operations. The safety director described the safety program and safety culture as very inclusive and employee driven. For example, job safety analysis (JSA) tasks are performed by employees working the job and reviewed by management. The safety culture was described as “we are our brother’s keeper”. If employees see something, they should say something.

The firm had a written safety program and JSAs for the tasks the decedent was performing at the time of the incident. The safety director shared the job safety analysis for “Closing Railcar Lids” with the MIFACE investigator; the de-identified JSA is attached as Attachment A. The JSAs are reviewed annually. The JSA for the loading activity had been reviewed in 2013 and 2014. The JSAs are used to train new employees and existing employees new to a task. At least annually, the JSAs were reviewed with all employees. Required personal protective equipment was

included as part of the JSA process. Jobsite inspections are performed one time per quarter by the management of the facility.

Due to the uniqueness of each facility, every facility has own safety policy. Employee safety meetings are held both annually and monthly. All safety meetings require employee attendance. At this facility, the management held an employee safety meeting in the early part of January 2014. Fall protection and ladder safety were discussed in July 2013.

Firm Remediation

The firm made both an engineering and procedural change to minimize a recurrence of this incident.

- Procedural: Prior to the incident, the "loader" was an entry-level individual or an individual who did not have a lot of experience. The firm now requires that the individual to have the requisite required experience to perform this task.
- Engineering: Figures 2, 3 and 4 show the engineering changes made to the exterior of the load out room by the firm. MIOSHA-compliant guardrails and spring loaded gates provide access to the railcars. Additionally, two fall arrest cables have been installed, one on each side of the exit door.

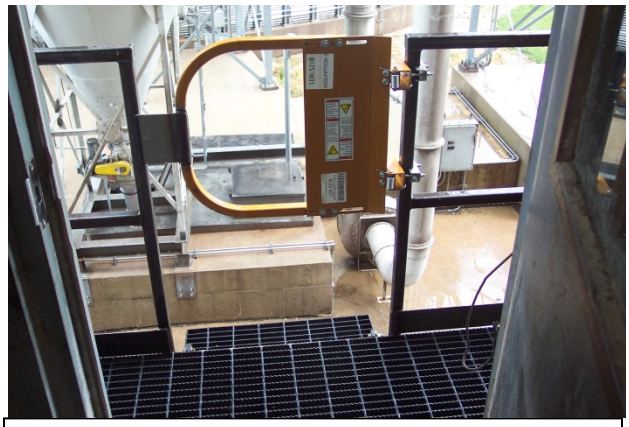

Figure 2. New platform to access railcars from load out room.

Figure 3. New platform to access railcars from load out room, spring-loaded gate.

Figure 4. New platform to access railcars from load out room, two fall arrest cables

MIOSHA General Industry Safety and Health Division issued one serious citation at the conclusion of its investigation.

SERIOUS: Michigan Occupational Safety And Health Act, Act 154, P.A. 1974, As Amended, Section 11(a):

The employer did not furnish to each employee, employment and a place of employment, which was free from recognized hazards that were causing or were likely to cause death or serious physical harm to the employee; in that employees are stepping out onto unprotected steps approximately 18 feet above the ground prior to attaching fall arrest cable.

Among other methods, one feasibly and acceptable abatement method to correct this hazard would be to guard step area where fall arrest cable is connected to harness. (Load Out Area Platform)

INVESTIGATION

Weather

On the day and time of the incident, the temperature was 3.7^0F, wind speed from the south-southwest at 20.7 mph with gusts 27.6 mph. The wind chill was -17.4^0F. It had snowed earlier in the day. The responding police indicated that the snow was blowing around, and there were sporadic whiteout conditions.

Load Out Room and Overall Incident Scene

Figure 5. Overview of incident scene. Steps to railcar in retracted position.

Figure 6. Looking up at the load out room and lowered steps.

The load out room was positioned above and to the west of the railroad line. The room was approximately 18 feet above the ground (See Figures 5 and 6). DBI/Sala Delta 1102000 vest style fall protection harnesses were hanging on hooks near the door. The door used to gain access

to the railcars was on the east side of the room; it opened inward. Directly outside the door were two 4-5 foot wide expanded metal hinged steps (Figure 7). The steps were lowered to approximately one foot over the top and one foot from the edge of the railcar with a hoist. The steps were supported by the building attachment; they were not held by the hoist. There was a chain standard barrier on the right side of the top step and none on the left side.

Figure 7. View of steps from platform in retracted position.

Figure 8. DBI Sala-Ultra Lok RSQ Self-Retracting Lifeline (SRL) attached to load out room.

To the individual's left after exiting the door, attached to the exterior wall of the load out room was a hook, to which a 50-foot long DBI Sala-Ultra Lok RSQ Self-Retracting Lifeline (SRL) was attached (Figure 8). The lifeline was secured to a trolley overhead beam that ran over and parallel to the railcars. The DBI Sala-Ultra Lok RSQ Self-Retracting Lifeline (SRL) provided fall arrest (the individual would fall only a few inches before the lifeline would activate) protection.

The railcar being loaded was approximately 15½ feet tall and 52 feet long. It had a serrated walking surface along the top. The railcar had three compartments and four hatches on top. The two hatches on each end were 2-feet-wide by 13-feet-long. The two center hatches were 2-feet-wide by approximately 11-feet-long. The railcar held approximately 231,000 pounds of soybeans, approximately 70,000 pounds per compartment.

Prior to loading a railcar, a premeasured amount of product (in this incident the product was yellow soybeans) would be loaded into a bin to be discharged through a hydraulically powered discharge chute; the controls for the chute are located inside of the load out room. There are no controls outside of the load out room.

Railcar Filling Operation

A switch operator controlled a switch engine which brought a string of railcars to the load out area to be filled with soybeans. The loader operator was stationed in the load out room awaiting arrival of the railcars and is required to wear the harness all day. Product was loaded through a series of bins called garners. There was an upper garner, a weigh hopper and a lower garner.

The grain was dropped from the upper garner into the weigh hopper. The loader operator looked out the window and, using his hand-held radio, radioed the switch operator to stop the railcar when the first railcar was in position for product loading from the premeasured bin of product. The loader operator, using a pendant controlled hoist located inside the load out room, lowered the steps over the edge of the railcar overlapping the edge of the railcar by about a foot. Then the operator opened the door and stepped out onto the lowered steps and hooked the fall arrest cable located on an outside hook to the left side of the door to his/her harness. The operator descended the two steps to the top of the first railcar and opened the hatches located on top of the railcar, ascended the steps, unhooked the SRL and secured it to the hook. Once unhooked, the operator entered the load room and used the controls to position the chute above the opening and began loading the product into the railcar.

When the first railcar had been loaded, the operator returned to the lowered steps, hooked the SLR to the safety harness, descended the stairs, closes and secured each hatch by placing a locking metal band (security seal) through the hatch latch. The operator then opened the hatches on the next railcar. He ascended the steps and repeated the process until the next to last railcar.

When filling the next to last railcar, a different loading procedure was used by the loaders. The operator opened the last railcar and then walked past the railcar being filled and closed and sealed the hatches to the previously filled railcar.

The entire railcar filling operation (for the 221,300 pounds of soybeans involved in the incident) took approximately 7 minutes to complete.

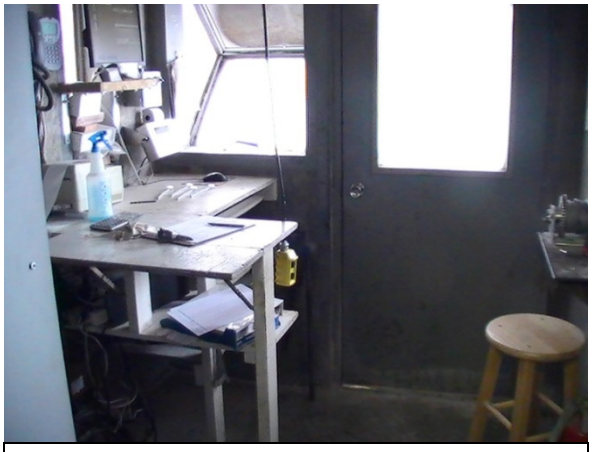

Figure 9. Load out Room

Incident

The top of the railcar and the steps the decedent used to access the railcar were free of ice and snow. The train was oriented in a north-south direction – in the direction of the wind.

The decedent was working with another individual in the load out room (Figure 9). It is unknown if, during the successful loading of several previous railcars whether the decedent had attached

the SRL to the back of his fall harness. The incident occurred while the next to last railcar was being loaded. The incident was unwitnessed. At some point during the loading process, the decedent fell into the open hatch. It was unknown why the decedent did not have his fall arrest cable hooked to his harness or what activity he was conducting at the time of his fall into the railcar. Some possible scenarios include that while the chute was discharging the soybeans he slipped/tripped while coming down the steps from the load out room or slipped/tripped while walking past the open hatch. The company safety director and the MIOSHA compliance officer noted scuff marks on the hatch lid.

Three of the decedent's coworkers were working in the control/dump room responsible for filling the premeasured bins. One of the coworkers noticed that the upper soybean bin was flashing full which indicated that the soybeans were not transferred into the weigh hopper and subsequently loaded into the railcar. One of the employees, knowing something was wrong, called 911. All of the individuals went to look to see what was wrong. When they could not find him, they opened the bottom of the railcar and started emptying the soybeans.

When they noticed the safety cable was still on its hook and not been hooked onto the decedent's safety harness, they thought he may have fallen into the railcar bin. Knowing which railcar compartment that was last filled, they emptied that compartment first. Two coworkers went in the railcar to try and find the decedent while three coworkers (one had just arrived at the scene) were dumping the beans out of the bottom of the railcar.

While one coworker stayed on the phone with emergency response, two of the decedent's coworkers removed him from the bottom of the railcar and took him into a doorway between the silos that was out of the wind. The decedent was wearing his safety harness but had not attached the fall arrest cable; the cable was still attached to a hook next to the load out room door. His coworkers checked his pulse. No pulse was found and they started CPR.

Police department personnel were the first to arrive on scene. A police officer hooked up and turned on the defibrillator. The defibrillator analyzed a few times, the police officer applied the indicated defibrillator shocks prior to the arrival of medical personnel. Additional response personnel arrived and CPR was continued. When the ambulance arrived, ambulance personnel also used their defibrillator and other medical intervention in an attempt to revive the decedent. Unable to do so, he was declared dead at the scene.

Police investigation found that the weigh ticket showed that the loading was started with the first compartment at 10:31:58 and the last beans loaded into the railcar was at 10:37:31 hours, at which time the coworkers in the dump/control room hit the stop switch and began their search for the decedent. Based on the time stamps and the time of retrieval of the decedent from the railcar, 10 minutes was the longest period of time the decedent could have been in the compartment.

CAUSE OF DEATH

The cause of death as listed on the death certificate was suffocation due to or as a consequence of a fall while loading grain. Toxicology testing for drugs and alcohol did not find substances that would have impaired the decedent.

RECOMMENDATIONS/DISCUSSION

- Install grating on the railcar compartment to allow product loading but prevent a fall into the open hatch.

MIOSHA General Industry Safety Standard Part 2 - Floor And Wall Openings, Stairways, and Skylights, defines a floor opening as an opening measuring 12 inches or more in its least dimension, in a floor, platform, pavement or yard, through or into which persons, material or equipment may fall, including but not limited to a hatchway, stair or ladder opening, pit or large manhole. Although the top of the railcar was not considered a "floor, platform, pavement or yard", the area on top of the railcar was routinely accessed and fall arrest protection was required to be utilized. An additional option to prevent a fall into the hatch would be to install grating that would not interfere with the loading activity but prevent an individual from falling into the open hatch while accessing the railcar or walking on top of the railcar.

- Access to the railcar should be retrofitted to minimize slips and falls.

The walking surface on the steps leading to the railcar was not slip-resistant, increasing the possibility of a slip and fall during wet/freezing/snowy weather. To minimize the possibility of a slip and fall, the access point should be retrofitted to a non-slip surface. There a several non-slip options, for example, serrated expanded metal, high traction (non-slip) coatings, non-slip tread pads, non-slip surface sheets, etc.

- Ensure compliance with fall protection policies and procedures.

For reasons unknown, the decedent did not adhere to the company policy to attach the fall arrest cable to the harness prior to accessing the railcars. The use of personal protective equipment is the least effective means of minimizing a hazard, because personal protective equipment relies on the user to use it consistently and effectively. It is unknown if the decedent routinely did not attach the fall arrest cable or if this was an isolated event.

There are many methods to implement safety procedures and practices for fall protection. Periodic unannounced safety inspections and audits of the workplace can be performed by site personnel to ensure corrective action can be taken immediately if there are observed deviations from the JSA requirements. Corrective action might include a form of discipline for unsafe acts or behavior, as well as recognition or reward for safe acts and behavior. Employers can enhance worker compliance with safe work practices through programs of task specific training, supervision, recognition, and progressive disciplinary measures.

- Monitor weather conditions to schedule loading/unloading activities during the best possible (least hazardous) weather.

Michigan winter weather is unpredictable, but weather forecasts can shed some light on possible upcoming weather conditions. The wind direction may have created a tunnel effect atop the railcar and a wind gust may have caused the decedent to lose his balance. MIFACE recommends that when possible, companies should pay heed to winter weather forecasts to schedule loading/unloading activities.

- Require non-slip footwear for the loader operation

The firm requires safety boots to be worn, but not slip-resistant safety boots at this operation. To further improve traction when working on potentially slippery surfaces, non-slip footwear should be required.

- The railcar loading operation should be a 2-person operation; one person (operator) to access the top of the railcars and perform the required tasks and the second person should act as a spotter to ensure the safety of the loading operator.

For accountability and safety, MIFACE recommends that the railcar loading operation be a 2-person operation. A buddy system could help prevent fatalities like this, by ensuring fall protection is worn, and if a fall into a railcar occurs, the grain flow could be immediately stopped to help prevent loss of life.

KEY WORDS: Railcar loading, soybeans, fall protection, fall arrest, slippery surface, grain and field bean merchant wholesalers, Wholesale Trade.

RESOURCES

MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available by writing to: Michigan Department of Licensing and Regulatory Affairs (LARA), MIOSHA Regulatory Services Section, P.O. Box 30643, Lansing, Michigan 48909, calling (517) 284-7740, or by FAX (517) 284-7735.

- Michigan Occupational Safety And Health Act, Act 154, P.A. 1974, As Amended. http://www.legislature.mi.gov/%28S%28g1chdyelhkhcsr55245brtaa%29%29/documents/mcl/pdf/mcl-Act-154-of-1974.pdf
- MIOSHA General Industry Safety Standard Part 2 - Floor And Wall Openings, Stairways, and Skylights. http://www.michigan.gov/documents/CIS_WSH_part2_35455_7.pdf

- *A Solar Panel Installer Dies When He Falls Off a Roof*. California FACE Case Report: 10CA003. http://www.cdc.gov/niosh/face/stateface/ca/10ca003.html

 November 4, 2015

ATTACHMENT A

CLOSING RAILCAR LIDS

JOB SAFETY ANALYSIS

JSA#:	**Job Safety Analysis**		
Task/Job:	**Closing rail car lids.**		
Group:	**Grain**	**Analysis Team:**	
Facility:		**Approved By:**	
Department:	**Operations**	**Date Approved:**	**12/20/2012**
Required PPE	Safety Glasses with Side Shields, Full Body Harness/Lanyard/ SRL, Steel toed footwear, Cotton gloves, Hard hat, Supplied work uniform		
Permits Required:	None		
Equipment Needed to Perform Task/Job:	None		

Job Steps	Hazards	Safe Work Practice
1. NEVER, EVER, EVER walk on the inside lid of an open rail car lid. Rail car lids are EXTREMELY slick and slippery. However, sometimes when loading rail cars there is no choice and you must step on the 1st lid to go seal the previous car lids. ALWAYS ATTACH SAFETY LINE BEFORE STEPPING ON LID AND USE AS MANY HANDHOLDS AS POSSIBLE FOR ADDITIONAL SUPPORT	• Fall/Same Level: Worker will slip and fall if they walk on the inside of a rail car lid. • Fall/Different Level: Worker will slp and fall if they walk on the inside of a rail car lid.	• Walk on catwalks and walkways on top of rail car. These areas are designed to provide traction • Walk on catwalks and walkways on top of rail car. These areas are designed to provide traction
2. Ensure harness is buckled correctly and fits snugly on individual. Periodically recheck the harness throughout the day to ensure harness remains snug; adjust to ensure snugness as necessary.	• N/A:	• Inspect harness before putting on
3. Grab appropriate number of seals & attach harness to SRL	• Ergonomic: Harness has to be attached & detached for every car loaded	• Rotate positions with another worker after every string of cars
4. Step onto car & proceed across gap to the rail car that was just loaded	• Fall/Same Level: Tops of rail cars become icy during winter months • Fall/Different Level: There is a gap between the stairs & the car being loaded. There is also a gap between cars that must be crossed	• Don't rush. Watch your step • Don't rush. Make sure harness is securely attached to the SRL.
5. Check ground between cars when crossing gap	• N/A: Gates on car bottoms do not always close correctly & grain may spill	• If grain is noticed, immediately contact someone to take care of it
6. Close all lids on the car that was just loaded	• Overexertion: Lids can be heavy • Ergonomic: There are generally 4 lids per car. There is a lot of repetition	• Use proper lifting techniques when throwing lids. • Rotate loaders after every string of cars. Avoid twisting
7. While closing lid, make sure edge of lid will not come in contact with individual or safety harness	• Struck By: Worker could be hit by lid when closing	• Be observant and ensure there is sufficient clearance between worker and lid.
8. Close latches & seal every other one	• Overexertion: Latches are at foot level	• Squat or kneel to close & seal latches; use proper technique
9. Cross back to currently loading car	• Fall/Different Level: Gap between cars • N/A:	• Be aware of footing • Check again for grain on the ground
10. Return to the loadout room & detach the	• Fall/Different Level: Gap between car	• Be aware of footing

harness from the SRL	& stairs to loadout room • Ergonomic: Harness must be attached & detached for every car	• Rotate loaders after every string of cars

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