

FATALITY INVESTIGATION REPORT

INCIDENT HIGHLIGHTS



DATE:

July 12, 2017



TIME:

2:15 p.m.



VICTIM:

49-year-old Certified Field Technician (equipment mechanic)



INDUSTRY/NAICS CODE:

Industrial Machinery & Equipment



EMPLOYER:

High Tech Machine Maintenance, Sales, Installation



SAFETY & TRAINING:

Safety meetings & training were limited at this employer



SCENE:

Employee was working at a high tech employer as a contractor. New employee was there to be trained by him.

EVENT TYPE:

Crushing/caught by

Maintenance Mechanic Crushed Working Inside of a Vertical Storage Machine

REPORT#: 2017-22-1

REPORT DATE: June 2019

SUMMARY

On July 12, 2017, a 49-year-old Certified Field Technician was killed after he climbed into a mechanical vertical storage unit to facilitate repairs. He had a new, inexperienced employee with him on the day of the incident; the Technician was training the new employee (Trainee) to perform routine preventive and/or scheduled maintenance (PM and/or SM). They completed one PM in the morning on a vertical storage machine. Work on a second machine was started after lunch at approximately 12:45 pm. A roller used to support a carrier tray* fell out, and the Technician could not reinstall it from outside the machine. A carrier was removed to provide space for him to enter the unit. He climbed inside, to lie on a carrier below the removed one. As the trainee cycled the machine to put the Technician in a position to access and reinstall the roller, the machine malfunctioned. The Technician asked the trainee to make another input to the controls. The machine advanced the Technician over the top of the vertical storage unit, which had very limited space. This action crushed the Technician, leaving him on the sealed side, opposite the side where he started. Pry bars were used to extricate the Technician but resuscitation attempts failed. (Full report begins on p. 4)

*Different terms were used by the investigator, machine owner, and the installer/repair technician to refer to the carrier tray (e.g., shelf, tray, or carrier). The term carrier is used for the purposes of this report.

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

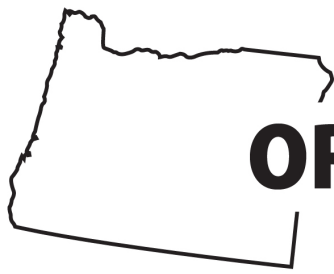
- Work being performed inside of an energized machine that was not treated as a confined space
- Lockout/tagout (LOTO) procedures were not applied
- Inadequate access to/knowledge of, alternate, safer method(s) to perform the work (i.e. options to work from outside the machine or rotate carriers without power)
- Failure to stop work despite an apparent machine malfunction.
- Inadequate training and communication regarding specific job hazards

RECOMMENDATIONS

Oregon Fatality Assessment and Control Evaluation (OR-FACE) investigators concluded that to help prevent similar occurrences, employers should:

- When selecting and installing equipment, ensure that maintenance can be performed without exposing employees to hazards. Making safe access easier and quicker will encourage safer work practices.
- Follow lockout/tagout procedures to reduce the risk of hazardous movement of machines prior to work in a confined space, and seek advice or consult the machine manual if unsure how a task can be accomplished in a de-energized machine (e.g., hand crank).
- Employers should never allow entry into a confined space that contains physical hazards until there is a positive movement control method developed.
- Routinely assess job hazards, provide regular, periodic training and communications on site-specific hazards and safe work practices, and take corrective action when needed. Check and monitor employees' knowledge of job hazards and implementation of safe practices to control hazards.
- Ensure the equipment manual is available and reviewed prior to working with equipment.
- Provide appropriate audits of lockout/tagout use (annually at a minimum).
- Equipment/Facility owners should ensure safe work practices are followed, and inform contractors and their employers when discrepancies are observed.

(Recommendations section starts on p. 10)



OREGON

State **FACE** Program

Fatality Assessment & Control Evaluation

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Oregon Fatality Assessment and Control Evaluation (FACE) Program

The Oregon Fatality Assessment and Control Evaluation (OR-FACE) Program is a project of the Oregon Institute of Occupational Health Sciences at Oregon Health & Science University (OHSU). OR-FACE is supported by a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH) (grant #U60OH008472) through the Occupational Public Health Program (OPHP) of the Public Health Division of the Oregon Health Authority. OR-FACE reports are for information, research, or occupational injury control only. Safety and health practices may have changed since the investigation was conducted and the report was completed. Persons needing regulatory compliance information should consult the appropriate regulatory agency.

OR-FACE supports the prioritization of safety interventions using a hierarchy of safety controls, where top priorities are hazard elimination or substitution, followed by engineering controls, administrative controls (including training and work practices), and personal protective equipment.



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INTRODUCTION

On July 12, 2017, a 49-year-old Caucasian male Certified Field Technician was crushed while working inside of a mechanical vertical storage unit (carousel) as a contractor. He was working with a co-worker (Trainee) on the day of the incident, and they had performed maintenance on more than one carousel that day. The Technician entered the machine and rode in one of the carriers in order to reach and replace a part that had fallen off. During this procedure, his Trainee advanced the energized machine, moving the Technician as he worked inside. The machine malfunctioned for unknown reasons, moving the Technician more than one space and in a different direction than intended. After discussion with his Trainee, the Technician requested the Trainee try to move him back to the opening. This resulted in the machine advancing in the wrong direction, causing the Technician to be crushed. He was moved over the top of the machine to the side opposite the opening. OR-FACE received notification of the incident from Oregon OSHA (OR-OSHA). This investigation report is based on review of OR-OSHA investigation documents, recordings and follow-up discussions with the OR-OSHA investigator, and best practices research.

BACKGROUND

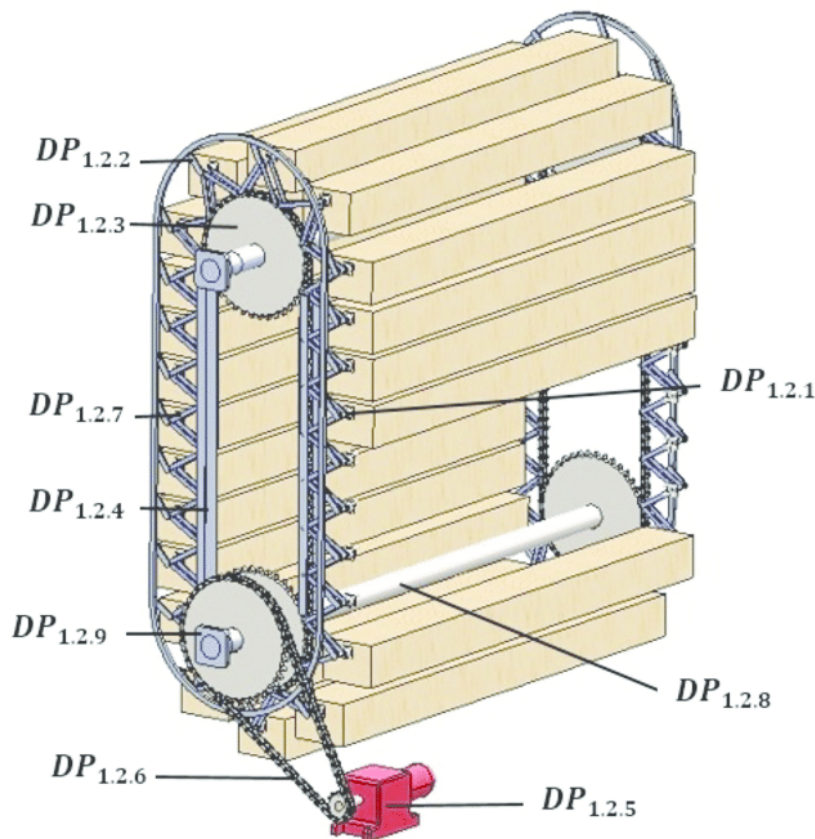
The two equipment technicians (one Certified, one a Trainee with no prior experience on this machine) arrived at the work site to perform preventive and/or scheduled maintenance (PM/SM) on two vertical storage units at a manufacturing facility. The units were owned by the host/contracting company and were used to maximize storage space while also enabling rapid retrieval of materials. In this type of machine, a series of numbered storage carriers are located on a vertical carousel, and a control panel is used to select the desired carrier number. The machine rotates in the most efficient direction and delivers the requested carrier to the opening. A light curtain is relied upon at the opening to stop operation if parts are sticking out, or if the operator breaks the opening space with any body parts. See the diagram on the next page for an example.

The two workers had successfully performed a PM/SM on a different vertical storage unit that morning. That work was performed outside of the machine. After the lunch break, they went to the second unit, which was older than the first (built in 1998) but operated in a similar fashion and used for the same purpose. During maintenance, the experienced Certified Field Technician entered the machine by removing a carrier to make space for him to lie down on another carrier to investigate a “squeak.” The machine was energized, and the Trainee used the machine’s control panel to advance carrier numbers, thus moving the Technician inside of the machine. The Technician found excessive grease and was moved up and back to the opening twice without incident to clean the chain and related parts. Each time during this task the Trainee was able to move him up and back down by selecting the next carrier number; sequentially, and one at a time. This was done to ensure the machine moved as desired, and was thought to be the only way to ensure the employee did not move over the top or under the bottom of the unit to the other side. The potential for other types of movement in the machine with different control panel inputs was possible. The software used to rotate the carriers was designed to move to the selected one in the shortest distance to the opening. This typically doesn’t matter with storage material stored inside the carriers, but with the limited clearance and a worker inside of the machine, this feature was likely recognized as a critical hazard by the Certified Field Technician in

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communications with his Trainee prior to the fatal incident. Unfortunately, we are unable to provide a picture of the machine control panel inputs, as the manufacturer or host employer deemed its design proprietary.

Importantly, in addition to the ability to move carriers with electrical power, the machine possessed a hand crank that could be used to rotate the carousel manually while the machine was de-energized. This alternative procedure would have allowed the unit to have been de-energized and LOTO procedures used. The employee could be moved as needed by the hand crank.



Example vertical storage unit design. *The unit involved in the incident was 12 feet high, 8 feet wide, and 11 feet deep. The machine exterior was a sheet metal housing with front and back access panels, but with only the front panel accessible. A hand crank was available to rotate carriers while the machine was powered off.*

(Image from "The Rational Footsteps for the Design of the Mechanism of a Vertical Carousel-type Storage Device", used with permission from Alberto Martinho)

EMPLOYERS

The decedent worked at an equipment sales, installation, and repair company. The company has been in business for 30 plus years. They employed a total of 36 employees in Oregon at the time of the incident, including the deceased. There were just two employees working at the site on the day of the incident. A different contractor also had two employees in the general area but they did not witness the incident. A representative of the work site and equipment owner escorted them into the facility each time they arrived to perform maintenance, and then left them unsupervised to perform their work once they were at their work area.

WRITTEN SAFETY PROGRAMS and TRAINING

The decedent's employer did provide locks and tags to every employee, but had not created a written LOTO procedure for working on this type of machine or for these machines in general. The equipment servicing team did not have a copy of the equipment manual, but the host work site/equipment owner did. The decedent's employer provided training from the equipment manufacturer to another group of employees in a different state. For reasons unknown, this training was not provided for Oregon employees, including the deceased. The specifics of the equipment manufacturer training were not provided.

Based on document review and discussions with the OR-OSHA compliance officer, training provided by the employer was informal at best or non-existent. It was reported that the company that owns the equipment had labeled the machine as a "confined space," and had provided some training to the Certified Field Technician addressing both these potential hazards (LOTO and confined space entry). The specifics of the training and procedures were deemed a trade secret by the company that owned the equipment, and so specific training information was not available. The compliance officer's review of available portions of the decedent's employer's documents indicated that site-specific job hazards were not addressed in any detail.

Interviews with other Certified Field Technicians revealed that the emergency or "E" stop was typically used if they had to reach inside the machine. Locks and tags were used when installing or building new storage carousels to ensure employees of the equipment owning work site did not attempt to start or operate them while the Certified Field Technicians were off site. These employees could not explain why the individual decided to enter the machine, but they also were unable to offer safer alternatives to repair the roller that fell off. The grease removal could have been done from a lower access panel according to one employee, although he agreed entering the machine was a faster way to do that task.

WORKER INFORMATION

The decedent had 4 years of experience working for this employer. It was reported that he was knowledgeable, experienced, and proficient in doing this work and that was why he was providing training to the Trainee that day.

INCIDENT SCENE

The incident occurred in a high tech manufacturing site. More than the one vertical storage carousel was present at this location, and the decedent's employer had been providing technicians to install and maintain these specific machines for years. The model involved was built in 1998 and is no longer manufactured. It was an older model relative to others on site, which were also installed (built), and serviced, by the decedent's employer. It was operated by an older style of control unit relative to the other machines. The difference was not explained in the notes or interviews, simply that it was older and different. The machine is approximately 11 feet long, 8 feet wide and stood just over 9 feet above and extended 3 feet below the floor (12 feet total height). There were 30 carriers inside that measured 9 feet and 9 inches long, and approximately 22 inches deep. The distance between each carrier was between 6.5 and 7.5 inches. The employees removed one of the carriers so the Technician could access the interior of the machine while riding (laying down) on a carrier below the one removed. According to the OR-OSHA Compliance Officer's report, the carrier tops are within 2 inches of the ceiling of the machine when they rotate over the top to the other side. Each machine carrier's capacity was 330 pounds. An imbalance would be detected if a carrier had more than 1600 pounds on it. In an imbalanced condition it is possible for the machine to auto-rotate.

The machine has two potential access areas, one on the front and the other on the back. It was set-up so that only one side could be opened, or it would shut off. Because of that, and the limited top clearance, it was imperative that the Certified Field Technician remain on the front side where the opening was to operate the machine. The motor used to move the carrier is a 230 volt (stepped down from 400 volts) unit with the potential for stored energy. The energy must be bled off after the main power source is disconnected. There is a hand crank on the machine that can be used to rotate the carousel, if power is disconnected.

WEATHER

The weather was not considered to be a factor in the incident as it occurred indoors. According to Weather Underground – Historical Weather, the average outdoor temperature on the day of the incident was 69 degrees Fahrenheit (F); the outdoor temperature at the time of the incident was approximately 80 degrees F. It was dry. Wind speed was reported as calm just prior to the time of the incident.

INVESTIGATION

It was reported that the two employees performed the planned scheduled maintenance (or preventive maintenance) on a similar but newer machine in the morning. After lunch, they started to perform a scheduled maintenance on the older (1998) vertical carousel at the host employer. The Certified Field Technician was also training the inexperienced Trainee on the process and methods for doing the scheduled maintenance. The Trainee stated he had never worked on these machines or anything similar. While doing the initial evaluation of the vertical storage carousel the employees heard a "squeak" or squeal. The experienced Technician determined he needed to enter the machine to inspect it. This was done by removing one of the carriers so he could lie on the one below. The Trainee was then tasked with moving him up and down that side of the energized machine so he could inspect and clean the two stress points above and below the access opening. After the Trainee successfully moved him up and down and back to the opening, the

experienced Technician exited the machine and used the same controller to rotate the carriers completely. While it was rotating, they heard a loud “clunk” and upon visual examination found a roller bar for one of the carriers on the front side of the machine that had fallen out of the track. They were unable to replace it from the outside, so the experienced Technician re-entered the machine using the same technique with the power on.

The Trainee moved him down one carrier at a time and the roller was reinstalled. When the next command was entered into the controller (to raise the Technician one carrier space), the machine malfunctioned and the experienced employee was carried up past the opening by several spaces. The Trainee was concerned and asked the experienced employee how they were going to get him back out. Despite the Trainee telling the Technician multiple times that the control had malfunctioned, the experienced Technician reportedly, and repeatedly told the Trainee to bring him back down one carrier at a time. When the Trainee entered the number to move him the next carrier down, the machine transported the Technician in the opposite direction up over the apex of the machine, ending up on the opposite side. As soon as the employee started moving in the wrong direction the Trainee pressed the emergency stop button, but by the time the machine stopped, the Technician was on the opposite (back) side with no way to reach him. That side was closed and locked. The experienced employee was still able to talk at that point but stopped almost immediately. The Trainee stated he was positive he had entered the right command both times and the machine did not move correctly.

Another contractor in the area noticed the Trainee in obvious distress and offered assistance. These were two different contractors performing unrelated work, and the other contractor called for assistance and then proceeded to work to get the employee out of the machine by using various tools to pry open the access door on the back side. This took about 5 to 10 minutes and additional first responders arrived as well. Attempts to save the crushed employee were unsuccessful.

It was reported that the machine was clearly labeled as a confined space. The Trainee confirmed he saw that confined space sign on the machine. The machine owner (host employer) had a written policy and contract with the deceased’s employer (contractor) that stipulated prior to entry, the machine owner was to be informed. The host employer also had provided basic/overview LOTO and confined space training to the experienced Technician. The specific date he received the training was unknown, but had to have occurred within the 4 years prior to the incident. The manual for the machine was on-site, and if requested, would have been available to the Technician and his Trainee. The decedent’s employer did not provide him with a copy, nor had they required employees carry one for this machine or any other machine they serviced at that location.

Evidence indicated that the light curtain and emergency stop were working properly. Attempts to replicate the malfunction in the controller were unsuccessful. According to the OR-OSHA Compliance Officer’s notes there was no record of movements or commands entered, stored or logged for the machine, and this was confirmed by the machine’s owner and the manufacturer. Other employees who had worked there doing the same type of work reported using the emergency stop and not actually locking out the machine when they reached inside. Aside from the process of installing or removing the whole machine, none of the other

experienced technicians employed by the decedent's employer could offer a reason for entering the machine. The same employees did state in interviews that during installation or demolition they would use lockout and tags to ensure the owner's employees didn't attempt to start the machine when they left the site.

The OR-OSHA compliance officer's notes were clear that the manufacturer's manual for the equipment stipulated that LOTO is required to enter the machine (the manual was provided to decedent's employer after the incident). In fact, the manual stipulates that entry should not be attempted without a complete LOTO and de-energization process. Special blocks are to be used to ensure there is no movement. A hand crank could also be used once power was off to move the carriers. The OR-OSHA Compliance Officer reviewed the correct and specific equipment manual for the model involved in the incident, and their notes referred to similar requirements. The manual was not provided for the FACE investigator as it was deemed a trade secret.

The cause of death was reported as a crushing injury. The OR-OSHA Compliance Office's notes stated that the movement of the carrier over the top of the carousel resulted in the employee being squeezed into and over the top of the machine with less than a 2 inch clearance from the top of carriers going over the top.

The equipment/site owner provided copies of their contract with the decedent's employer and their policy for when contract workers had to enter confined spaces. The contract stipulated the contract workers employer (decedent's employer) was responsible for training him on confined space hazards, as well as LOTO procedures for these machines. Because the decedent's employer was the sole authorized dealer for the vertical storage carousel, the equipment/site owner considered them to be the experts in determining and following safe work procedures. The fact that there were other contractor employees working unsupervised in the area, with different expertise, is consistent with this statement. The equipment/site owner provided documentation to the compliance officer that showed the machine had been identified and labeled as a confined space in 2001. The hazard assessment conducted by the equipment/site owner indicated that the moving machinery posed a serious hazard. They also repeated their expectation that prior to any entry of the machine, they should have been notified by the relevant contractors in advance.

CAUSE OF DEATH

According to Oregon Vital Records data, the cause of death as determined to be compression asphyxia.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. OR-FACE investigators identified the following factors that may have contributed to this incident:

- Work being performed inside of an energized machine that was not treated as a confined space
- Lockout/tagout (LOTO) procedures were not applied
- Inadequate access to/knowledge of, alternate, safer method(s) to perform the work (i.e. options to work from outside the machine or rotate carriers without power)

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- Failure to stop work despite an apparent machine malfunction
- Inadequate training and communication regarding specific job hazards

RECOMMENDATIONS/DISCUSSION

- ***Recommendation #1: When selecting and installing equipment, ensure that maintenance can be performed without exposing employees to hazards. Making safe access easier and quicker will encourage safer work practices.***

Discussion: Despite the warnings in the manual, and a machine label clearly identifying the interior as a confined space, the decedent chose to enter the machine to perform his maintenance work (removing extra grease and adjusting the tension on the top and bottom). If the machine had been designed with easy exterior access to the adjustment points and chains, he may have decided to use those access points rather than remove a carrier and climb inside. If a safer alternative is easier than an unsafe option, employees are more likely to use the safer alternative. If, on the other hand, additional steps (time and effort) are required for the safer method, shortcuts are likely to be used. Having already removed the carrier and successfully entered and exited the machine once, when the employees were unable to replace the roller from the outside, the “easy” solution was to again enter the machine and perform that work. Had an alternate access point been planned for and implemented when the machine was installed, the workers may have chosen to use that access point instead.

- ***Recommendation #2: Follow lockout/tagout procedures to reduce the risk of hazardous movement of machines prior to work in a confined space, and seek advice or consult the machine manual if unsure how a task can be accomplished in a de-energized machine (e.g., hand crank).***

Discussion: The company should have developed a specific hazardous energy management LOTO program to control or eliminate exposure to this hazard. They could have stipulated in the procedure that if entry was required, LOTO would be used and the hand crank applied to move anyone inside. Oregon OSHA regulations require LOTO procedures be developed for each machine to ensure hazardous energy sources are controlled and stored energy removed and prevented from re-accumulating. The confined space regulations require that hazards are removed or controlled prior to entry.

- ***Recommendation #3: Employers should never allow entry into a confined space that contains physical hazards until there is a positive movement control method developed.***

Discussion: The hazard posed by movement of the carousel over the top could have been prevented if something had been immediately available to stop the movement of the carriers. It should have been identified as a “fail-safe” option after the control command to move one carrier at a time in a specific direction failed a second time.

- ***Recommendation #4: Routinely assess job hazards, provide regular, periodic training and communications on site-specific hazards and safe work practices, and take corrective action when needed.***

Discussion: Supervisors should regularly assess the effectiveness of safety training by asking workers questions about their work plans, observing work practices, and providing feedback. The purpose of this type of assessment is for the employer to ensure that employees are adequately knowledgeable of hazards (including potential hazards), and that they understand appropriate, safe work practices and how to implement them. Supervisors should monitor and provide feedback about employees' safe work practices, including how to recognize and control hazards. None of the supervisors or managers at the host work site were trained to work on these machines, and no one had evaluated how contractors were performing the work.

- **Recommendation #5: Employers should ensure the equipment manual is available and reviewed prior to working with equipment.**

The manual was on site and available had the employee or their employer asked for it. The machine owner assumed that by hiring the equipment manufacturer's approved vendor for their region to perform this work, that they (decedent's employer) were experts. Had it been reviewed, the manual states that "Transport of persons and animals as well as staying inside the access area is forbidden." In addition, the manual identifies the need to secure the unit when working on a motor, gear box, or drive chain by removing a line plug or turning off the main switch and locking it".

- Follow all owner precautions on equipment (labeled as a confined space)
- Follow equipment manufacturers' instructions
- Establish safe work procedures in advance for performing LOTO work;
- Employers should train workers on how to identify hazards and ensure that they follow safe procedures as listed above.

The machine owner's hazard assessment listed mechanical equipment movement as the primary hazard. The employee who entered the machine addressed neither hazard. It is likely that he did not understand the potential hazard he was exposing himself to, based on his insistence the Trainee outside try to move him again after the machine moved in the opposite direction and more spaces than he planned or expected.

- **Recommendation #6: Provide appropriate audits of lockout/tagout use (annually at minimum)**

Discussion: While it may not have prevented this fatal incident, no one at the decedent's company had reviewed the equipment manual. Therefore, no one was fully aware of the potential hazards or informed to take appropriate actions, such as having a discussion with employees, developing a LOTO procedure, or providing clear directions to employees to affirm the company's expectation that LOTO was to be used (and not e-stops). The host work site employer could have stipulated that contractors use the hand crank once the lock was applied. The decedent's company reportedly did check and monitor employees' knowledge of job hazards and implementation of safe practices (including LOTO) at other locations when work was being performed on different types of equipment. No specific reason was given for not doing that with the vertical storage units at this particular site. There were three employees of the 36 at the decedent's employer who were trained to work on this equipment; none of the supervisors had that

training. An additional recommendation would be to ensure supervisors and/or managers know enough about the work being performed to adequately assess the hazards their employees could be exposed to.

- **Recommendation #7: Equipment/Facility owners should ensure safe work practices are followed, and inform contractors and their employers when discrepancies are observed.**

Discussion: Despite the identification and labeling of the interior of the machine as a confined space presenting a physical hazard (unplanned movement), the equipment/facility owner relied solely on the contractor as the expert to ensure safe work practices were developed and followed. A request for the specific LOTO procedure may have alerted the facility owner to a gap in the experts' knowledge of the hazards, as there was no specific LOTO procedures established. This may have also encouraged more communication regarding the facility owner's designation of the machine as a confined space and the related hazards to the contractor/decedent's employer.

DISCLAIMER

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REFERENCES

The incident described in this report is relatively rare based on a review of NIOSH databases. We did not find any similar fatalities or hazard evaluations of similar equipment. Resources addressing work hazards were incorporated into this report and are provided below.

Oregon OSHA, Division 2, Subdivision J, General Occupational Safety and Health Rules, OAR 437-002-0146 Confined Space and OAR 437-002-0147 Control of Hazardous Energy (Lockout/Tagout).

<<https://osha.oregon.gov/OSHARules/div2/div2J.pdf>>

Weather Underground. <https://www.wunderground.com/history/>

Additional resources:

Oregon OSHA's "Basics of Machine Guarding states:

<https://osha.oregon.gov/OSHAPubs/2980.pdf>

"Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures that provide effective protection. Selection of an alternate control method must be based on a risk assessment of the

machine, equipment, or process. The risk assessment must consider existing safeguards provided with the machine, equipment, or process that may need to be removed or modified to perform a given task.” In addition the hierarchy of controls can be used to prevent another incident starting with:

Eliminate the hazard – include access for lubrication and tension adjustment that is easily done outside of the machine

Prevent exposure – the manual had it been reviewed was explicit that entry was not permitted

Use Administrative Controls – provide hands on training and effective supervision (employees reportedly did not use LOTO on equipment unless leaving it in need of further work overnight. Enforce safe work practices – no one from the company provided on site review of work practices for this equipment though they did for others.

NIOSH Publication 2007-131, Ergonomic Guidelines for Manual Material Handling discusses the benefits of vertical storage carousels as “*Vertical carousels rotate and present items on shelves or roll out drawers within the worker’s power zone.*” This type of equipment will likely grow in popularity and use as it provides more storage in the same floor space than standard carrier units. Parts can be obtained in less time than with standard shelves and forklifts, and as the manufacturers state the enclosure reduces dust or similar contamination.

INVESTIGATOR INFORMATION

Steve Eversmeyer, Contract Fatality Investigator/Outreach Specialist, OR-FACE Program conducted this investigation. The report was reviewed and received input from Ryan Olson, PhD, Director, OR-FACE Program, and the OR-FACE Publications Review Panel.

ACKNOWLEDGEMENT

The Oregon FACE Program would like to acknowledge the compliance officer and staff of Oregon Occupational Safety and Health (Oregon OSHA), a division of the Oregon Department of Consumer & Business Services, for providing assistance and information during this investigation. Attempts to discuss this with the machine owner and manufacturer were unsuccessful.