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Lesson 6: Caught in Between Hazards

Lesson Focus

This lesson focuses on the following topics:

- What is the Caught in Between Hazard?
- Preventing Caught in Between Hazards
- Observing Behaviors to Coach workers to Safer Behaviors

What is the 'Caught in Between' Hazard?

OSHA's website states that the top four causes of construction fatalities are a result of:

1. Falls
2. Struck-by
3. Caught in between
4. Electrocution

In this lesson we will discuss situations in which workers can be caught in between equipment, moving loads, or even safety guards. This hazard exists in many situations where struck by hazards also exist. For instance, a worker can be caught in between a falling slab and a concrete foundation or a worker can be caught (or pinned) in between a vehicle and a structure. Also, workers can be caught in between a collapsed trench that is not properly braced, or warehoused construction materials that was not correctly stacked to prevent sliding. In 2016, there were 72 construction deaths that were reportedly caused by a caught-in/between event.

The recognized hazards related to caught-in-between accidents come from:

- Cranes and Heavy Equipment
- Tools and Equipment
- Material Handling
- Trenching and Excavations

General Construction Site Caught-in-Between Hazards

When workers are not paying attention to their body position in relation to a caught-in-between hazard, they place themselves between an immovable object and a moveable one. Sometimes, the worksite has limited access and travel ways between staging materials. In such a situation, the workers will find themselves squeezing between a loaded forklift and pallets of materials.

If the forklift operator loses his focus or has an event in which they lose faculties, then the workers walking between the two loads can be crushed. A clear walking path must be established with the workers being trained to keep those paths free from heavy equipment.

Cranes and Heavy Equipment

Cranes and heavy equipment can cause a variety of injuries to the workers in a dangerous location. The worker must never place their body between the tracks and the super structure of the crane. Though it is the closest area to communicate with the driver, this is an extremely dangerous practice. The crane operator and the personnel must have alternative means of communication to avoid this practice.

Workers that place themselves between a fixed object such as a wall and have heavy equipment operating behind them or next to them are also in the line of fire. If a backhoe operator is starting an excavation next to the wall where the person is standing, then the possibility of an accident becomes greater.

When a crane is actively moving a load from one area to the next it produces a swing radius for the rotating part of the equipment with the load. The individual that is within the swing radius of the crane can be struck-by the load or if the load drops, they can be caught-in between the material and the ground.

It is important for the worker to always keep a safe distance from the equipment to avoid having their feet or legs crushed by being rolled over by the equipment. Some workers are caught up in the job and forget the boundaries that must be maintained from equipment, vehicles, and themselves. It is common for individuals to get their feet in the path of a skip loader or backhoe and get their feet crushed by the equipment.

In the construction standard, 1926.1424 OSHA requires Work Area Control for a swing radius hazard where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonable risk of striking and injuring an employee or pinching/crushing the employee against any part of the equipment.

The work area must be delineated as to the location that is off limits to anyone on the construction site that isn't authorized or trained to recognize the hazards within that swing arm radius. Additionally, the general public must be restricted from entering the construction site especially, around cranes and derricks with an active load.

Tools and Equipment

Most tools and equipment that are not used per the manufacturer's recommendation will lead to some misuse or even a hazardous condition. Guarding of portable power tools and bench tools often have guards taken off for reasons that are behaviorally driven. The worker may feel that they are able to see the work better so they remove the guard on the equipment creating a new hazard.

When a guard is missing, it becomes easier for loose clothing, gloves, or jewelry to get caught up in the rotating parts of the equipment. Once that occurs the speed of most equipment will snag the loose item and pull it into the machinery. In the event of that happening, it becomes more difficult to pull out the part of the body that the loose item is attached to. That would lead the worker into a crushing injury. It is best practice to never place hands or the body near moving parts.

The construction manager should have a daily inspection of the integrity of the equipment that is on the construction site. Each person that uses the equipment must also keep a log of when it was checked and if there are issues such as broken parts or missing safety functions. This will ensure a regular check of the equipment and help in avoiding any future caught-in-between accidents.

Material handling

Workers must use extreme caution when handling material from one location to another. It is common to see workers "stabilizing" a load by having their hands on the material as it is traveling by crane or rough terrain forklifts. This practice can lead to being crushed by the load if there is a shift due to road conditions, driver error, or poor rigging. Workers that have to guide a load in anyway must not use their own hands on the load, but an approved tag line or guide line.

The stacking and storing of material is important, because the worker that is walking next to the load will be more susceptible to getting trapped under the load if there is a shift in the balance of weight. A clear walking path for pedestrians is needed to ensure that if any material that is being stored tips, it will not land on a worker.

Storage of materials must be in a manner that will aid in the stability of the product. They must be stacked or interlocked in a way as to not create a falling object hazard. The height of the material also matters as to the stability of the cargo. If the product is too high, then it will be easier for it to tip one side or the next. This can lead to someone getting trapped underneath the load.

Workers must be ever mindful as to not place themselves in a way that will pin them against an immovable structure. This will come from hazard recognition tools and training. A system of near miss reporting can bring to light any conditions that may be hazardous and cause a debilitating injury.

Masonry and Stone Work

The hazards associated with handling concrete slabs include being caught in between slabs if they fall or shift onto a worker.

Some caught in between hazards have been documented while transporting granite and marble slabs. During loading, transport, and unloading of these slabs, the loads have been known to shift and tip over. Workers can either be caught in between slabs or they can be struck by such shifting or falling slabs.

Jacking equipment must be capable of supporting at least two and one-half times the load being lifted during jacking operations, and the equipment must not be overloaded. Lifting inserts that are embedded or otherwise attached to tilt-up wall panels must be capable of supporting at least two times the maximum intended load applied or transmitted to them. Lifting inserts for other pre-cast members, excluding tilt-up members, must be capable of supporting four times the load. Lifting hardware members must be capable of supporting five times the maximum intended load applied to the lifting hardware.

Erected shoring equipment must be inspected immediately before, during, and after concrete placement. All base plates, shore heads, extension devices, and adjustment screws must be in firm contact, and secured when necessary, with the form and foundation. Shoring equipment that is found to be damaged or weakened after erection must be reinforced immediately.

Vehicles

We have already discussed the need to equip vehicles with backup alarms or provide flaggers when drivers do not have a clear view to the rear. It is bad enough if a worker is struck by a vehicle, but if he or she is also pinned or caught in between another stationary surface, there is a high likelihood that life or limb will be lost.

Blind spots on construction vehicles must always be checked for. When a vehicle is large and has an enclosed cab, it can make blind areas around the equipment which are hard to see. This can be hazardous for ground workers and pedestrians, specifically on roadway work zones.

Trenches

If a trench collapses on a worker, he or she may be caught in between the rubble. In addition to the collapse hazard, at times a backhoe may be used to lower material like a precast pipe section into a trench with a worker present. In this case he or she may be adequately protected by remaining in a trench box while the backhoe is operated.

If a trench worker was to stand directly between the hoisting path and the trench box wall, he or she would be vulnerable to both the struck-by and caught in between hazards. However, if a long trench box (or several adjoining ones) was provided and the worker was far enough away from the backhoe and hoisting path to eliminate a struck-by or caught in between hazard, then he or she could safely remain in the trench box.

Preventing Caught in Between Hazards

Safety Measures

Engineering controls like shoring, fall protection systems, and properly stacking building materials can help prevent caught in between hazards. Some strongly recommended safety practices are:

- Never allow workers to enter an unprotected trench (or excavation) that is 5 feet or deeper unless an adequate protective system is in place; in many cases, trenches less than 5 feet deep may also require such a system.
- Ensure the trench (or excavation) is adequately protected by sloping, shoring, benching, or trench shield systems.
- Follow fall protection guidelines per 1926.502 Subpart M.
- Always properly stack building materials so they are clear of work areas and so they do not suddenly shift or slide onto a worker.

Trenches

Trenches 5 feet or deeper must be protected using any of the following protective systems. In many cases, even trenches that are less than 5 feet deep must be secured. Protective systems are used to ensure that trenches do not collapse onto workers.

All trench protective systems must be designed or verified by a competent person and/or an engineer. These systems include:

- Sloping
- Shoring
- Benching
- Trench Shield Systems

Fall Protection

While guardrails are a critical engineering control used to protect workers from falling, they can pose a caught in between hazard under certain circumstances. Subpart M addresses this hazard.

Guardrails and Suspended Load Clearances

Guardrail requirements can actually create a hazard at the leading edge of installed floor or roof sections by creating the potential for employees to be caught in between guardrails and suspended loads.

Ensure there is an allowance for a clear work space (path) in which to guide any suspended load into position for placement and welding of members. This is necessary to eliminate, this particular type of caught in between hazard.

Operational plans must always allow for adequate work areas in which to move suspended loads.

Stacking Building Materials

Building materials must be stacked in such a way as to prevent their toppling over. Always allow enough space around stacks of materials or wide walkways to allow workers to quickly move out of the way in case materials slide or are accidentally pushed over.

Many of the accidents that are caused by struck-by and caught-in accidents are behavioral in nature. If a worker feels that they can do something to get an edge at work or even perform a task faster, they may become prone to unconsciously put themselves in a situation which might lead to an accident.

There is a safety and health tool known as behavior based safety (BBS) program that picks at risk behaviors and monitors the worker to understand why they are behaving in a way that can hurt them. This behavior is called at-risk behavior and it can be coached towards safe behaviors through the BBS program.

Common Human Performance Snares

There are several behaviors that can cause a human to perform below expectations. These performance traps or snares will show themselves to be behaviors to be coached in a BBS observation. To overcome these behaviors the coach should be aware of what they are and how to help the worker understand ways to master the behavior. The following are common human performance snares and ways to overcome them.

Time Constraints

One of the most common human performance snares are workers feeling that they have a time constraint forcing them to cut corners. There are many actual pressures related to jobs such as due dates, daily schedules, personal pressures for performance, and frontline supervision time crunches. Sometimes pressures are legitimate and cannot be adjusted or easily adjusted.

When there is a time constraint due to a pressing engagement such as an emergency situation, then the employee will have to make decisions rapidly. During times where there are rapid decisions needed, the employee must rely on what is already a habit strength. Habit strength will leave the worker resorting to their homeostasis for behavior. In the behavior-based safety program the workers will be trained to use safe behaviors versus at-risk behaviors which would lead them to that habit strength in time of emergencies.

However, in some cases workers just use time constraints as a way of avoiding what is the opportunity to use safe behaviors. In these situations, the coaching session should include some tools that can help deal with time constraints. The coach should consider certain considerations when coaching this particular behavior:

- The coach can perform a self-check to see if there was truly a time constraint to perform this duty
- A peer check of the situation will also reveal if another person is feeling a time constraint for performing this task
- A pre-job briefing would help the worker to see the whole job and visualize how long it will take
- A careful consideration of the worker's attitude at the time of the job will reveal if they are placing a self-pressure on time
- Create an opportunity to do a three-way communication to ensure that all considerations were taken prior to performing a task
- Was policy and procedure followed for the employee performing the task or was it bypassed?

Interruptions or Distractions

In some cases, at-risk behavior is caused because the worker is being distracted or interrupted during the task. In order to successfully coach this individual, there must be an assessment of what was the distraction and where did it come from. In some cases, the distraction can come from the worker himself or an outside source such as a phone ringing.

In coaching distractions or interruptions, first there must be a removal of the distraction itself, or the removal of the employee from the distraction area. The employee should perform a system check prior to resuming the task to make sure all conditions are still safe for operations.

It may also be a good idea to have the worker seek assistance from a coworker before resuming work in order to assess the situation for any more distractions or interrupting forces. Then all distraction should be removed so that the worker can focus on how to perform a task with safe behaviors.

Multitasking

As the creation of technology becomes commonplace, more people are doing what is known as multitasking. The term multitasking implies that the person can do more than one task at the exact same time. It is nearly impossible for workers to multitask in the purest sense of the word. Worker can, however, try to switch rapidly from one task to the next in order to multitask.

This can become a very dangerous pattern of behavior that can lead to mistakes on both or more processes. The worker should prioritize a list of tasks he/she needs to accomplish first. Once a task is accomplished then the next task in line should be tackled. If the worker feels that they have too many tasks that are due at the same time then they might feel tempted to multitask. This activity will only slow them down and potentially create substandard outcomes.

Overconfidence

When a BBS observation team finds a worker who is overconfident, they will notice certain behaviors that can lead the worker to be at-risk of hurting or injuring themselves or others. In some instances, the worker will feel that they do not need to be checked behind because they performed the work correctly the first time. However, this is not always the case and even the best worker can forget steps in the procedure.

To help workers overcome the feeling of overconfidence (that they are too good to make a mistake), the coaching team should ask them how they would feel if they did not get all the steps correct and there was an incident. This may get them to rethink the idea of never making any errors. Additionally, the coaching session may include the idea of having them question or challenge their own expectations through a self-check.

The supervisor should routinely reinforce expectations of policies and procedures with this individual. Then they should show the individual, or a work team that maybe overconfident, some benchmarks from industry leaders.

Vague Guidance

There are incidents where workers developed at-risk behaviors because they were informed of a job through vague guidance. It is a possibility that the supervisor himself/herself might not have a good understanding of the task at hand, therefore the information that was disseminated to the worker was vague. When this happens, there is no clarity of roles and responsibilities or even procedures.

The BBS steering committee must address this issue through the front-line supervisor. If there are established policies or standard operating procedures for a certain job then it must be reviewed by all parties. Standard operating procedures are there to make sure that each step of the job has been identified.

The worker should be encouraged to ask questions if they're unsure of any guidance given by the supervisor. And the supervisor should have a good understanding of the job and ensure that all workers understand each task that has been assigned to them. In some cases, the supervisor might even require retraining on how to perform any given task that they are responsible for delegating.

Overnight Shift Work

In some instances, there is a human performance letdown for workers that are working the overnight shift. The shift was typically from 11 PM at night to 7 AM in the morning or some variation of working during the early morning time period. Workers who were on the shift for a continuous amount of time learn how to adapt to the schedule. However, new workers will need a break in time to adjust to this lifestyle change.

During the time that the new late shift operator gets their body adjusted to their work schedule, there are chances of at-risk behavior due to drowsiness or other related factors. It is possible that they are unable to sleep during the day because they are used to sleeping at night and the sudden change of schedule might keep them from getting ample sleep.

Therefore, at home, the late shift worker must have systems in place to keep them from getting fatigue. Some workers are known to use blackout curtains and shut off all electronic devices during the sleep hours. When you are coaching the worker who is showing at-risk behavior during the night shift consider the simple things that lead to

fatigue. It must be your common goal to have a worker assimilate to the new schedule when they are new on a job.

In some cases, to help prevent this issue the shift supervisor should monitor the new hire and coach them on how to get better sleep after the job is complete. Additionally, some coaching from coworkers will help them.

Some other behaviors related to late-night work can lead to lazy turnovers during the day shift when the workers feel fatigued in the final hours of the work shift and become labored. Therefore, final checks must be done before the day shift workers come to take over the process.

To combat this issue, it may be necessary to have a more detailed shift turnover between the lead operators. Another tool that can be used to combat this issue is to have a detailed checklist of each shift, regardless of if it's day or night. The checklist will serve as a reminder as to what is required for each shift. So, the behavior of laziness due to fatigue can be mitigated by a detailed checklist.

Peer Pressure

Social impact from peers in the workforce is very important to monitor. This impact can be both good and bad depending on the individuals involved. When there's a workforce that is very tightknit and the safety culture that values low risk, then many workers will encourage each other to have safe behaviors.

In some cases however, there may be a "bad apple" among the workers. If this bad apple has some social impact on the workers, then more workers will have at-risk behavior as a result. Is important for the front-line supervisor to be an agent of change and not be the bad influence themselves. When poor behavior is observed among multiple people in one division then it is easy to assume that this behavior that is being pressured or conditioned in that one group.

The assessment of the at-risk behavior may lead to modeling from an agent of influence in that group. It may be the front-line supervisor or someone who's been there for considerable numbers for years.

Peer pressure can result in some behavior such as:

- Taking shortcuts with safety
- Ineffective or misleading communication
- Inadequate use of procedures
- Dereliction of rules

- Inadequate job briefings
- Not using peer checks
- Inadequate self-checks

In these instances, there may be a need to have progressive disciplinary action when there are cases of workers who are being pressured to have poor behavior. The influencer must be acknowledged and put on notice until the behavior changes. The management team should consider separating the work team or unit to two different locations or divisions in the company.

A positive way of also creating a new peer pressure towards good behavior is to have mentoring and coaching opportunities for all at-risk workers. Peer mentoring will also help the workers see that it is possible for someone at their level to have a positive strong influence. This will also indicate to the worker that the organization cares for them and is willing to work with them to improve behaviors.

Change

Some workers are averse to change, so when there is a change happening they become more prone to at-risk behaviors. They might become uncertain about what to do and their changed behavior might be a way to get attention. Attention seeking behaviors can lead workers to an injury or illness because their mind is not on the work but on gaining attention.

Change may be inevitable in some organizations, but workers need to feel that they are still in the system. Certainty in the system will enable the workforce to feel more comfortable in the idea of change and understand that it is in their best interest. In some cases, it is better to inform workers of the change and give them all scenarios related to the event before any actions are taken.

When dealing with operations such as the process safety management programs, the change analysis must be made prior to any major change. A change analysis is a detailed system that is utilized for the workers to see what domino effects will happen from changing a major element of their system.

This analysis is performed through the entire organization and utilizes systematic steps to analyze all repercussions of the change. For instance, if a company wants to change from using gas chlorine to liquid bleach then a change analysis is in order. The release of gas chlorine into the atmosphere can create adverse effects for the whole community and not just the workplace. However, liquid chlorine bleach is not as harmful to a community if released into the atmosphere. The change analysis would incorporate all

necessary parts, equipment, training, and regulatory requirements prior to the occurrence of such a major change in the system.

Physical Environment

There may be some performance issues due to the actual layout of the workspace. Things like poor lighting, ventilation problems, or even layout of machines can lead to poor workmen behaviors. Many workplaces have worksite analysis to make sure that there are no environmental factors adversely impacting any part of the job.

Workers will be the first ones to see if there are any physical environmental problems that are leading them to at-risk behaviors. They will work around them as best as possible through whatever means available to them.

A third-party audit would be a great way to analyze the work environment to ensure that there are no physical issues that would lead the workers to adapt at-risk behaviors. When the assessment is complete, a third-party auditor will have a final report with recommendations. Once recommendations have been read and understood, the organization should start making all the required changes to the physical environment promptly.

Mental Stress

Mental stress is produced by many things in the work environment. Although, workers may also bring some stresses from home. In the past, it was believed that workers could separate their home life from work life, but this is not always the case. Some workers will exhibit at-risk behaviors because of home stresses.

Mental stress can produce severe outcomes when they are coupled with at-risk behavior in the workplace. Some jobs are not forgiving when it comes to any form of deviation from safe practices. In some cases, the worker will not only hurt themselves and their coworkers but their behavior might even affect the community or the environment adversely.

Mental stress coupled with fatigue can also be a deadly factor for employees and their coworkers. There can be distractions as well as worker harassment that may be an outcome of mental stress. Some workers internalize stress in such a way that they become pressurized with emotions until there is a breaking point with a certain work situation or an interaction with a person there was a previous friction with.

At all costs the workplace should have areas where workers can release mental stresses to prevent at-risk behaviors. One such way to combat mental stresses is by providing an employee assistance program for workers which provides them with the chance to talk about any stresses that are happening in their lives to a psychologist or a mental health professional. These mental health professionals are used often to help workers cope with home and work life.

Additionally, when there is at-risk behavior observed, and mental stress is the conclusion, then the coaching should be sympathetic. When dealing with situations when workers are under stress, understanding the source of stress is important. The best approach is to try and eliminate the source of stress in the work atmosphere. Clearly communicating all expectations of the organization to have stress free workers and environments is of the utmost importance. Workers who are observed for stress should have increased supervision and coaching. If stress cannot be eliminated, then a managing approach must be taken.

Organizations can utilize stress limiting or reducing techniques. These include, but are not limited to:

- Workplace sponsored teambuilding activities
- Calisthenics and yoga
- Wellness programs
- Sponsoring of a community event
- Collaborating with a nonprofit organization to perform activities such as feeding the homeless, reading books to children, or helping with literacy programs

Understanding these common human performance snares will enable the steering committee or assigned coaches to give the workers a better understanding of how to combat some at-risk behaviors which will help them perform their jobs in a better way.

Lesson Summary

Operational plans must always allow for adequate work areas in which to move suspended loads. While guardrails are a critical engineering control used to protect workers from falling, they can pose a caught in between hazard under certain circumstances. Guardrail requirements can actually create a hazard at the leading edge of installed floors or roof sections by creating a possibility of employees being caught in between guardrails and suspended loads. Because workers can also be caught in between a collapsed trench that is not properly braced, or warehoused construction materials which were not correctly stacked to prevent sliding, engineering and workplace

controls like shoring, fall protection systems, and properly stacking building materials can help in preventing caught in between hazards.

Sometimes the workers fall into a common human performance trap that leads to at-risk behaviors which can put them in the way of hazards. It is important to recognize the behaviors and address them through coaching efforts.