

Roadway Construction “Caught-In” Series

Entangled in Equipment and Machinery



GRAPHIC: ARTBA

According to the U.S. Occupational Safety and Health Administration (OSHA), “caught-in” or “caught-between” hazards are one of the leading causes of death and injury in the construction industry.¹ These incidents are defined as injuries resulting from a person being squeezed, caught, crushed, pinched, or compressed between two or more objects, or between parts of an object.

Entanglement and entrapment hazards are classified as “caught in” or “caught between” by OSHA. Exposures to this hazard occur when clothing, hair, jewelry, or body parts become caught within machinery and equipment that have unguarded moving parts or that are not de-energized (locked out) during maintenance. Almost all work sites use machinery that has moving or rotating parts or that requires maintenance or repair at some point during construction.

If machinery is not properly guarded or de-energized during maintenance or repair, injuries from caught-in or between hazards may result, ranging from amputations and fractures to death. When machines or power tools are not properly guarded, workers can get their clothing or parts of their body caught in the machines. If machines are not locked-out when they are being repaired, they may cycle or otherwise start up and catch a worker’s body part or clothing and cause injury or death.



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Example: A three-man crew was installing an underground telephone cable in a residential area. They had just completed a bore hole under a driveway using a horizontal boring machine. The bore hole rod had been removed from the hole. While the rod was still rotating, the operator straddled it and stooped over to pick it up. His trouser leg became entangled in the rotating rod, and he was flipped over. He struck tools and materials, sustaining fatal injuries.

What actions might have been taken to prevent the worker in the example above from being killed?

There are three main categories of exposure that can lead to entanglement injuries. These are:

- Pinch-points—where two or more parts move together. Parts may be rotating, moving, or moving in a circle, such as pulley and belt systems.
- Crush-points—where two parts of a machine move toward each other, such as with a hydraulic cylinder.
- Wrap-points—where one or more parts rotate continuously. These include lathes, augers, mixers, and many other types of equipment.

OSHA imposes both specific regulations and general duty obligations on employers to help prevent employees from suffering entanglement injuries. These include administrative and engineering controls. Administrative controls that attempt to prevent entanglement injuries include dress codes, training on safe work practices (such

¹ OSHA Training Institute, “Struck-By Hazards Instructor Guide.” https://www.osha.gov/sites/default/files/struckby_ig.pdf.

as prohibitions against working alone when entanglement hazards are present), and proper procedures for shutting down and locking out equipment before performing maintenance operations (lockout/tagout).

Engineering control requirements cover safety operations such as placing guards on machinery and equipment that prevent contact with a machine's moving parts. For situations where preventative measures may fail, and a worker becomes entangled, easily accessible emergency shutoffs are needed; these are also considered engineering controls.

Appropriate Clothing

Workers should select clothing appropriate for the task to be performed. Ensure pants and shirt sleeves are not too long or too loose. Shirts should be fitted or tucked in. Do not wear any kind of jewelry. Rings, chains and other accessories can become entangled and catch, pulling a limb into equipment, or preventing one from pulling out. Tie back long hair, braids and ponytails behind the head, or tuck them into the clothing. If gloves are needed for your task, ensure they fit well.



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Assess Potential Hazards

Look for possible pinch points, crush points, and wrap points before starting a task. Be aware of hazards that could entangle clothing, hair, or limbs. Plan your actions and decide on the necessary steps that must be taken to work safely. When entanglement hazards are present, barricade, guard, or mark them to the extent possible so workers are alerted when they are near. Provide training and post warnings so those exposed pay full attention.

Most on-the-job accidents occur when workers are distracted. Read and follow warning signs posted on equipment. Think carefully about the task before putting hands, fingers, or other body parts in a hazardous spot. Never reach into a moving machine. Properly maintain and always use the machine and tool guards provided with the equipment; they act as a barrier between the moving parts and your body. Never circumvent a guard by reaching around, under or through it. Report missing or broken guards and barriers to supervisors. Always turn equipment off and use lockout/tagout procedures before adjusting, clearing a jam, repairing, or servicing a machine.

Control Measure Checklist

Most of the risks of entanglement and entrapment can be controlled by observing the following safety procedures:

- Substitution (elimination) – switch the machine for another that has lower risk factors;
- Guards (engineering) – ensure guards are properly fitted to prevent access to moving parts and scissor points that may have contact with clothing or the body;
- Guards (engineering) – attach guards so they that cannot be removed; when available, install interlocking guards which require a special tool to be removed;
- Guards (engineering) – inspect guards for damage; repair and replace all guards before re-energizing and restarting equipment;
- Emergency Stops (engineering) – install emergency stop systems to shut down the machine in the event of a hazardous incident;
- Lockout/Tagout (engineering) – remove keys and place a lock out/tag out system prior to removing guards and performing repairs, maintenance, or cleaning. Ensure any stored energy is bled (air, hydraulics, capacitors, etc.) before commencing maintenance and repair work.
- Training (administrative) – provide equipment operators and workers stationed near equipment with adequate training and appropriate supervision before approaching or using hazardous equipment;
- Safe Clothing (engineering/administrative) – instruct operators and workers to not wear loose clothing, hair, jewelry, or other wearable items that may get caught in moving parts;
- Signage (administrative) – post proper warning signs to remind operators and others of the potential hazards associated with the equipment.



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