

WORKING AROUND HEAVY EQUIPMENT

Heavy Equipment (Two Major Hazards)

Heavy equipment such as cranes, maintainers, bull dozers, front loaders, dump trucks, excavators, etc. are used on virtually every single construction site. There are many hazards created by the use of this equipment for those who operate it and especially for those who work around the equipment. It is easy to become complacent when working around these machines every single work day. The Center for Construction Research and Training states that heavy and mobile equipment were responsible for 7,681 construction worker deaths between 1992 and 2010. It is important to continually remind yourself of the hazards of working around heavy equipment.

There are many different hazards associated with heavy equipment. It is impossible to list every single hazard and scenario down here during this safety talk. Instead we will discuss the two major hazards associated with these work tasks that are responsible for the majority of injuries and fatalities.

1. **Struck-by incidents-** One of the biggest exposures for a fatality on a construction site is ground personnel being struck by moving equipment. **OSHA states** approximately 75% of struck-by fatalities involve heavy equipment such as trucks or cranes.
 - Everyone's responsibility to look out for one another while working around this equipment.
 - Work areas where heavy equipment is should be clearly marked and barricaded.
 - Unnecessary foot traffic should be eliminated in these barricaded work areas.
 - Ground personnel entering a work area where there is equipment operating need to make their presence known to all operators in the area.
 - Operators should avoid backing whenever possible and need to stop their work task if they lose sight of any ground personnel.
 - A spotter should be used if equipment is operating in a tight area or when operating around ground personnel.
 - Plans works tasks accordingly and eliminate the need for a spotter if possible.

2. **Caught-in or between incidents-** A struck-by incident is when an object striking a person causes the injury. A caught-in or between incident is when there is an injury due to crushing between two objects.
 - An excavator bucket swinging around and striking a person in an open field would be a struck-by incident.
 - An excavator counter weight that turns and pins a person against a wall
 - Many of the same safeguards discussed above will protect workers
 - Never put yourself in a situation where you do not have an out to escape danger. It is important to always be able to get out of the way if other safeguards fail and you are put in a situation where you can become of victim of these incidents.

While falls and electrocutions are leading injury causes on construction sites, being struck by objects and caught in-between mechanical components and materials pertain more to heavy equipment operation than general site conditions. The key to preventing or reducing equipment-related injuries is to mitigate potentially dangerous conditions and make all workers aware of their situation.

Situational awareness is an all-encompassing term describing worker alertness and knowledge of their job site surroundings. It's critically important for all workers to be aware of these hazard categories:

1. Mechanical Hazards

All heavy construction equipment has moving parts. It's the energy stored and being capable of releasing from machinery parts that present danger. When not in motion, most machines are relatively stable and safe. It's when they're operating that they have enormous power and the capability of doing severe damage.



When working around machines, watch for moving parts that can reach people. Also, machinery and equipment that can eject objects and strike someone can be dangerous. Common mechanical hazards include rotating shafts, colliding surfaces, scissor or shear action, sharp edges and detachable connections. Risks associated with mechanical hazards are entanglement, crushing, severing, cutting and puncturing as well as slips and falls when dodging moving components.

2. Non-Mechanical Hazards

Not all heavy equipment hazards come from components in motion. Almost all machines have stored energy waiting for release. That can be gasses or fluids under pressure, electrical charges and hot surfaces. Worker hazards from non-mechanical means also include noxious substances like exhaust emissions and chemical by-products. As well, consider the noise hazard that heavy equipment operation generates.

Situationally aware workers always assess their machinery for non-mechanical hazard potential. They realize how heavy equipment affects the area or environment around them. Common non-mechanical hazards are:

- Dust
- Explosive or flammable atmospheres
- Radiated and conducted heat
- High-intensity light like lasers or welding arc flashes
- Heavy metals including lead, mercury and cadmium



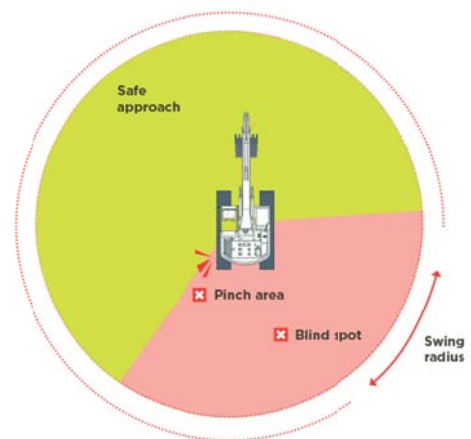
- Steam releases
- Ionizing radiation such as microwaves and X-rays

Health risks from non-mechanical hazards include burns, lung damage and long-term increased risk of cancer-related diseases.

3. Access Hazards

Many workplace injuries and deaths happen because workers have unsafe access around machinery paths. Without safe access to and from a particular point, workers become accidentally trapped and exposed to mechanical and non-mechanical hazards. Being caught in-between dangerous components or struck by objects is avoidable by proper planning, placing safeguards and raising workers' situational awareness.

Important considerations for mitigating access hazards are considering who is allowed into a hazardous area or situation and what equipment and materials are in operation. Access control must be predicted and planned in advance rather than reacting to an unexpected situation. The most effective solution for minimizing access accidents is effectively communicating all information concerning mechanical and non-mechanical heavy equipment hazards.



Communication and Heavy Equipment Safety

Hazard mitigation involves a series of orders for controlling potentially dangerous situations. **If at all possible, hazards should be eliminated altogether or at least substituted by something less dangerous.** If that's not possible, then risk controls are necessary to prevent or reduce the chance of harm or injury. Workplace health and safety regulations make it mandatory to communicate workplace hazards and risk controls. Laws require hazard communications be applied in what's called the "highest order."

High-order risk controls immediately communicate safety cautions. Examples of high order communication are non-mistakable signage that clearly identifies existing hazards and prescribes safe actions for workers exposed to them.

Lower-order hazard controls communicate precautions necessary for workers to be safe around potentially dangerous equipment. Prescribing the right personal protective equipment is a lower order communication tactic. So is stipulating safe workplace behaviors like de-energizing equipment and locking out activation devices.

Administrative controls are part of the hazard communication order chain. This involves detailed instructions for safe operation and exposure reduction such as standard operating procedures (SOPs). Verbal communication like toolbox meetings is another effective form of administrative controls for accident prevention.

Many workplaces use administrative controls to pass on safety tips to workers. Effective safety programs are all-inclusive and involve workers at all levels from equipment operators to those working around them. It's through communicating safety tips and reinforcing the importance of heavy equipment safety that situational awareness improves. Then, the risk of being a fatal four statistic dramatically drops.

Construction Equipment Safety Tips

Staying safe around heavy equipment is everyone's business. So is sharing information on construction equipment safety tips. The best companies with the strongest safety records have a corporate culture where safety is the way they do business. They've built their safety record on a behavioral-based approach where they allow workers to commit to safety rather than being merely compliant to regulations.

Safety-minded cultures encourage all workers to identify barriers to safety and work as a team to remove them. They communicate all workplace hazards and educate workers on hazards around construction machinery as well.

It's an ongoing process to identify and control job site hazards. Often, situations change on a site as work progresses, and it's important to communicate evolving conditions. However, there are many situations where workers face the same hazards from day to day. Here are some of the proven and reliable safety tips that benefit all those working around heavy equipment:

- **Stay out of the line-of-fire.** This is a top-priority safety tip. The line-of-fire refers to every place around a piece of heavy equipment where a worker can be caught in-between or hit by a mobile object. Enforcing the line-of-fire rule is a two-way street involving both operator and ground worker. There has to be effective communication about what the machinery operator plans to do and what's expected of workers around them.
- **Make eye contact.** Eye contact with a heavy equipment operator is critical for safety. By making eye contact, it's assured that both the operator and surrounding workers are aware of each other. This prevents an operator from swinging a machine or material toward a stationary worker who might approach inside the line of fire.
- **Use effective communication signals.** Many construction sites use radio communication between machine operators and support workers. Knowing what others are doing and communicating changes in

operation are mandatory for safety, and there's no better way than with a verbal exchange. However, radios aren't infallible. Clearly displayed and understood hand signals are fail-safe communication devices.

- **Have spotters.** Many construction equipment operators like those on excavators, delivery trucks and cranes rely on spotters as their second pair of eyes. Every machine has its blind spots where the operator is visually impaired. Using a ground spotter is high-value insurance against accidentally moving the equipment or material into a potentially dangerous position.

- **Identify and mark a danger zone.** Marking a danger zone effectively communicates hazards to anyone approaching construction equipment. The danger zone is anywhere that the line-of-fire starts and stops. It's straightforward to mark the danger zone with barriers, fencing or caution tape. Simple signage that clearly states the safety boundaries also works.

- **Ensure situational awareness.** This safety tip can't be over-emphasized. It's vital for everyone on a site to be situationally aware of their surroundings. Two of the terrible

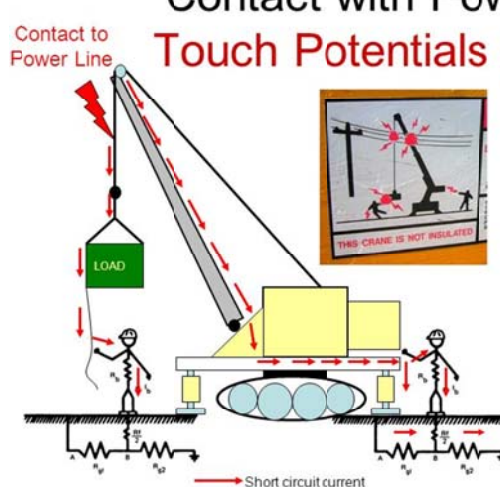
offenders for causing injury are overhead and underground hazards. That can be power lines struck by booms or raised dump boxes. It can also be buried electrical or gas lines. Being aware of the situation saves lives.

- **Keep eyes and mind on task.** Being alert is absolutely required for safety. Workers who keep their eyes and mind on their task are far less likely to cause or be involved in an accident. Common contributors to inattentiveness are fatigue, complacency, frustration and rushing. **Safety experts say that distractions like these can account for 95% of contributing factors in construction site accidents.** Workers

didn't think about or see the hazards even though they knew they were present.

- **Identify entrances and exits of equipment zones.** It's wise to have a dedicated entrance and entry to equipment zones, and those zones should be a clear and safe path that avoids operator blind spots. It also needs to be free of slip, trip and fall obstacles. Those zones should be unmistakably marked and rigidly enforced.

Contact with Power Lines Touch Potentials (Voltage)



DOW RESTRICTED - For internal use only

Mitigation Requirements:

- Persons on the ground shall not touch or approach the lift equipment. The lift equipment structure, load lines and load will be energized and a hazardous touch potential / voltage exist.
- If tag lines are used, they must be non-conductive.
 - Dry polypropylene, nylon, etc.
 - Metallic, conductive or cables, wet ropes, chains and the like shall not be used.