CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

HAND-HELD CUT-OFF SAWS IN CONSTRUCTION: PROPER USE AND TRAINING NEEDED FOR POWERFUL TOOLS

A CPWR fact sheet developed with support from the NIOSH-NORA Construction Sector Council

Worker uses a cut-off saw to cut concrete blocks
Photo Credit: International Union of Bricklayers and Allied Craftworkers

Construction workers rely on a variety of hand-held power saws to cut through tough materials like tile, brick, stone, concrete, steel, and iron. Among these cut-off saws, also called concrete saws, abrasive saws, and quick-cut saws are among the most powerful and widely used. These high-speed tools make demanding cuts possible, but if not handled properly, they pose serious risks.

CPWR's review of OSHA's Fatality Inspection Data revealed numerous fatalities and serious injuries involving cut-off saws, highlighting the severe risks of improper use. These tragedies serve as a stark reminder of the importance of proper training, implementing safe operating procedures, and strict adherence to the manufacturer's instruction manual.

Struck-by incidents, including those caused by saws, are the leading cause of non-fatal traumatic injuries and the second leading cause of fatalities among construction workers. Some hand-held cut-off saws pack over 7 horsepower, generating extreme cutting force. One wrong move can result in serious injury or sometimes death. The saw's high-speed rotation creates multiple reactive forces, increasing the risk of sudden kickback, blade pinching, or material ejection. If the tool is used improperly, the saw itself, or the material being cut, can become a deadly projectile.

But the dangers don't stop there. For example, cutting silica-containing materials produces respirable crystalline silica dust, a hazardous airborne contaminant. Prolonged exposure can lead to silicosis, an irreversible and potentially fatal lung disease.

**This Fact Sheet provides essential safety information on proper cut-off saw operations to help prevent struck-by injuries, fatalities, and exposure to hazardous silica dust. With cut-off saws, there's no room for error.

POTENTIAL HAZARDS

I. SAFETY ISSUES

Cut-off saws have different types of cutting or abrasive blades designed to cut through materials such as wood, metal, and concrete. Blades are typically diamond-tipped, carbide-tipped, or abrasive disks.

The primary safety hazards with these saws arise when the rotating blade is suddenly slowed or stopped due to pinching or binding in the material being cut. This can trigger powerful reactive forces, increasing the risk of serious injury.

There are three main types of reactive forces operators may encounter:

- **Pull-away** – The saw moves forward, away from the operator.
- **Climbing** – The saw lifts slightly and tries to "climb" onto the material.
- **Rotational kickback** – The most dangerous, occurring when the blade violently jerks upward and backward toward the operator.

Pull-away and climbing forces can often be controlled with proper hand position, stability, and stance. However, rotational kickback is a violent force when the blade instantly moves up and back ("jumps back") toward the operator. In addition to pinching or binding in the material being cut, other factors that contribute to kickback include sideloading (too much pressure to the side of the blade), not using the proper tool for cutting the material, and cutting with the upper quadrant of the blade just under the front of the fixed guard.

Surveillance data of injuries from use of cut-off saws in construction is limited because saws are often grouped together regardless of type. A review of "cut-off saw" incidents under federal jurisdiction in **Occupational Safety and Health Administration (OSHA) Severe Injury Data** that occurred within construction (NAICS 23) revealed 39 records of severe cut-off saw kickback injuries from 2015 to 2023. Case reports from available OSHA Investigation Summaries provide brief descriptions of some of these severe incidents. For example:

- *In May 2020, an employee was using a cutting saw to cut a section of concrete. The saw hit a rebar rod and kicked back landing on the foot of the employee causing a laceration (cut) on the top of his foot. The employee received medical treatment but was not hospitalized.*

- *In October 2023, an employee was working for a water/sewer installation contractor. The employee was using a cut off saw to cut pipe and when the employee's shirt got caught in the blade the employee was pulled into the rotating saw. The blade struck the employee in the chest killing the employee.*

II. SILICA INHALATION

Dust created by cut-off saws is a potential health hazard. Concrete cutting with hand-held saws can produce elevated concentrations of respirable dust, a portion of which is composed of respirable crystalline silica (RCS). Repeatedly breathing too much of this dust can eventually lead to silicosis, lung cancer, chronic obstructive lung disease (COPD), and decreased lung function. The dust can be a hazard not only to the saw operator but also to other nearby workers.

Photo Credit: Washington State Construction Center for Excellence

OSHA estimates that 2.3 million Americans—including 2 million construction workers—are exposed to RCS at work, at more than 600,000 workplaces (OSHA 2016). A recent study found that of the 100,000 workers exposed to RCS above the recommended exposure limit (REL), 79% worked in the construction industry.

OSHA's Respirable Crystalline Silica standard for construction requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers. The standard provides that employers can either use the control methods laid out in "Table 1" of the construction standard, or they can measure workers' exposure to silica and independently decide which dust controls work best to limit exposures to the Permissible Exposure Limit (PEL) in their workplaces. The OSHA Silica Standard for Construction Table 1 provides engineering and work practice control methods: these include integrated water delivery or dust collection systems for cut-off saws and a variety of other tools along with requirements for respiratory protection in different situations.

III. OTHER HAZARDS

Carbon Monoxide (CO)

Handheld gas-powered cut-off saws produce high levels of CO, a poisonous gas that is colorless, odorless, and tasteless. It can accumulate if the saw is being used in work areas such as basements, precast concrete pipes, and vaults. OSHA sets limits on permissible CO levels and NIOSH has recommendations to decrease exposure to CO. Prevention actions include switching from gas-powered saws to electrically or pneumatic/compressed air-powered saws, proper saw maintenance, and effective ventilation.

Fire

The main fire risk related to cut-off saws comes from sparks produced by the blade or wheel making contact with the material. This can ignite nearby materials, so it is important to clear the work area of debris or combustible material before cutting. Additional risks include faulty equipment or improper use of the blade guard.

Flying Particles & Debris

Additional struck-by hazards include the risk of workers being hit by flying particles and debris from the material being cut. Be sure to properly support all materials while cutting. Clear the nearby area and/or make sure adjacent workers are protected with PPE.

Noise

Handheld cut-off saws produce high levels of noise. Prolonged exposure to loud noises can produce irreversible hearing loss. OSHA sets limits on permissible noise levels and NIOSH has recommended exposure limits for occupational noise exposure. It is important to invest in noise reduction measures such as use of quieter tools and routine equipment maintenance. Hearing protection devices may also be needed to decrease workers' noise exposure.

PREVENTION

Safety and health hazards associated with the use of cut-off saws in construction can be prevented through effective preparation and planning, training, use of work site best practices, and PPE.

PREPARE AND PLAN FOR SAFETY:

- ✓ **Select or purchase equipment with prevention through design features**, such as anti-kickback devices.
- ✓ **Review the manufacturer's operator's manual** (instructions and safety precautions) for all tools that may be used and make them available to staff.
- ✓ **Follow applicable OSHA regulations** – OSHA's Informational Booklet on Hand and Power Tools may be helpful. Make sure tools are equipped with appropriate engineering controls (e.g., dust collection systems and integrated water delivery systems for wet cutting). Check out the following resources to review task-based controls of silica dust for construction tasks using various types of hand-held and larger tools:
  - ✓ OSHA Fact Sheet – Control of Silica Dust in Construction: Handheld Power Saws
  - ✓ OSHA Video - Handheld Power Saws (Any Blade Diameter)
- ✓ **Perform job activity-level hazard analyses prior to beginning work tasks** to identify potential hazards and ensure proper control measures.
  - ✓ Include considerations for protection of employees who work near equipment, but do not directly operate the equipment.
  - ✓ Check out CPWR's Pre-Task Planning Guidelines and Resources to evaluate and improve your process.
- ✓ **Use the hierarchy of controls** as the basis for selecting controls for identified hazards.
- ✓ **Have relevant safety devices available for use if needed**. For example, a pawl, clamp, or other safety device can help restrain the working surface or limit movement of the blade in only one direction. Some manufacturers have introduced new technologies designed to enhance safety by stopping the rotation of the cutting wheel in fractions of a second if kickback occurs.
- ✓ **Provide all personal protective equipment needed for the job tasks** (see below).

PROVIDE TRAINING:

- ✓ **Train all workers on safe work practices (see below) in the language(s) they understand**. Training should apply to the specific equipment in operation and be based on the manufacturer's recommendations. Effective training is an important part of a strong health and safety program. Provide training emphasizing the proper use of all tools. Workers should be able to recognize the hazards (e.g., mechanical energy from saw blades still coasting after being turned off; inadequate structural integrity of remaining building materials being cut; exposure to dust from use of the saws; noise) associated with different types of tools and the necessary safety precautions.
- ✓ **Remind workers that many saws leave much of the blade exposed**. The blade can make contact with the operator before or after the cut, as well as during the cut if the operator's hand is securing the material being cut from underneath and in the path of the blade. For example, guards used on cut-off saws may self-adjust to the thickness of the material being cut, so they will allow the blade to continue cutting until there is no resistance (i.e., the guards do not necessarily prevent blade contact).
- ✓ **Consider utilizing toolbox talks and trade journal articles** to assist with training.

USE SAFE WORK SITE PRACTICES:

Worker uses a handheld power saw with integrated water delivery system. (Photo Credit: OSHA)

- ✓ **Understand each saw is different**. As with any piece of equipment or power tool, it is important to read, understand, and follow the operating instructions and safety precautions in the operator's manual.
- ✓ **Ensure proper blade usage**. Manufacturers make different saw blades for different materials. Some blades should only be used with certain materials and specific tools.
- ✓ **Inspect all equipment.** Do not use power tools that need repair (e.g., safety guards not functioning properly) or replacement. Closely inspect the cutting blade for any signs of damage. If there are missing/broken parts on the saw or the associated engineering controls (e.g., wet cutting system), the saw should be tagged out of use with the reason for its removal. Consider using additional methods to ensure it is not used, such as removing the spark plug or blade.
- ✓ **Do not use hand-held saws overhead or when standing on ladders and stepstools.** Hand-held saws pose special dangers if kick-back occurs because the worker can lose control and drop the saw, endangering themselves and those working below and nearby. In addition, experiencing saw reactive forces at height could cause a worker to fall. If elevated cutting is required, make arrangements for safe operation using a scissor lift, scaffolding, or suitable elevated work platform.
- ✓ **Ensure that saws cannot be started unintentionally.** As with any power tools, machinery, and other powered equipment, hand-held saws should be inoperable when they are not in use and/or when blades are being changed. Unplug cord-based saws and retain control of the cord (e.g., by tying it to the tool), and remove the battery for battery-powered saws. Fuel-powered saws should be allowed to cool for several minutes after use. Remove the spark plug wire or use a run safety switch if present.
- ✓ **Use appropriate controls.** Protect against inhalation and other hazards by implementing engineering and other controls as appropriate.

PROVIDE PERSONAL PROTECTIVE EQUIPMENT (PPE):

- ✓ Personal protective equipment (PPE) for cut-off saws varies depending on the job task. Employers should provide workers with PPE following manufacturers' recommendations for the equipment and controls (e.g., water) being used. PPE often includes head protection (i.e., hard hat or helmet); safety shoes, steel-toed, and/or waterproof boots; aprons; safety glasses, goggles or face shields; hearing protection; cut-resistant gloves; and respiratory protection.
  - ✓ If respiratory protection is used, it should be used in accordance with the employer's respiratory protection program.
- ✓ Employers should follow specific OSHA standards for construction as needed. For example, eye and face protection is addressed in specific OSHA standards for construction.
  - ✓ Employers may find American National Standards Institute (ANSI) and ASTM International information helpful. ANSI and ASTM International are **organizations** that develop and publish technical standards for a wide range of issues affecting worker safety. For example, ANSI Z87.1 provides information on eye and face protection, and ASTM International F2413 provides information on performance requirements for protective footwear.
- ✓ Employers should also make sure PPE and other clothing and workwear fit all workers properly. Loose clothing or PPE can create an additional hazard by becoming caught in the saw.

When operating a cut-off saw, DO:	***When operating a cut-off saw, DO NOT:***
✓ Follow the manufacturer's recommended blade and guard specifications for the saw being used and materials to be cut. ✓ Inspect the cutting blade for warping and damage before startup. ✓ Prevent the blade from overheating, which can warp the surface and cause kickback. ✓ Test newly mounted blades at normal operating speed for 30 seconds, with the guard in place, before beginning use. ✓ Keep all body parts away from the blade while it's running. ✓ Maintain good balance and footing, using both hands and a firm grip on the handles. ✓ Use the blade in a manner to avoid becoming pinched in the cut. ✓ Use extreme caution when reentering a cut. ✓ Support and secure concrete, asphalt, structural steel, and other materials being cut so they do not fall, pinch the blade, or crush workers. ✓ Ensure there are no gas or electric utility lines embedded within cutting zones. ✓ Allow the saw to cool before refueling.	✓ Cut in the vicinity of anything flammable – most cutting procedures produce sparks. ✓ Cut on material which is or may become unstable. ✓ Use the saw without the blade guard in place. ✓ Exceed the maximum operating speed marked on the blade. ✓ Jam or wedge the blade into a cut. ✓ Operate a damaged, improperly adjusted or improperly balanced saw. ✓ Use the saw overhead or on a ladder. ✓ Wear loose clothing which could become caught in the cut-off saw blade.

ADDITIONAL RESOURCES

SAW SAFETY

- U.S. Department of Energy Office of Environment, Health, Safety and Security [2023]. Preventing Injuries from Power Saws. https://www.energy.gov/sites/default/files/2023-06/OE-3%202023-02%20Power%20Saws.pdf
- OSHA [2002]. Hand and Power Tools. https://www.osha.gov/sites/default/files/publications/osha3080.pdf
- Applicable OSHA standards for hand and power tools in construction - https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.302
- Safe At Work California [2021]. Masonry and Concrete Saws. https://www.safeatworkca.com/safety-articles/masonry-and-concrete-saws/
- ANSI/ISEA Z87.1-2020: Current Standard for Safety Glasses - ANSI Blog. https://blog.ansi.org/ansi-isea-z87-1-2020-safety-glasses-eye-protection/.
- Connecticut Training and Technical Assistance T2 Center [2020]. Tailgate Talk: Safe Use of Cut-Off Saws: https://www.cti.uconn.edu/Document.asp?DocID=8996.
- Weekly Safety Meeting – Concrete Cutting Safety – Safety Matters Weekly. https://safetymattersweekly.com/weekly-safety-meeting-concrete-cutting-safety/.

SILICA

- NIOSH. Silica and worker health. https://www.cdc.gov/niosh/silica/about/index.html
- OSHA. Crystalline silica, construction. https://www.osha.gov/silica-crystalline/construction
- OSHA. https://www.osha.gov/silica-crystalline/construction-info
- OSHA Fact Sheet. Control of silica dust in construction: handheld power saws. https://www.osha.gov/sites/default/files/publications/OSHA_FS-3627.pdf
- OSHA Video. Controlling respirable crystalline silica in construction: handheld power saws (any blade diameter). https://www.youtube.com/watch?v=pfYI31pF4Ng
- OSHA 1926.1153 Table 1—Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica. https://www.osha.gov/sites/default/files/2018-12/fy16_sh-29650-sh6_ExposureTable.pdf

REFERENCES

- Power Tool Institute, Inc. Glossary of Terrms. https://www.powertoolinstitute.com/pti-pages/ed-glossary-terms.asp. Accessed on February 27, 2025.
- OSHA [2016]. Occupational Exposure to Respirable Crystalline Silica Final Rule. https://www.govinfo.gov/content/pkg/FR-2016-03-25/pdf/2016-04800.pdf