Queensland Government

Workplace Health and Safety
Electrical Safety Office
Workers' Compensation Regulator

https://www.worksafe.qld.gov.au/news/safety-alerts/whsq/2015/multi-cutters-and-other-discs-on-power-tools-and-air-tools

Purpose

To highlight hazards associated with the use of multi-cutters and grinding or cutting discs fitted on power tools and air tools.

Background

Workplace Health and Safety Queensland have investigated a number of serious incidents caused by using cutting and grinding discs on hand held power tools and air tools. Common injuries are amputated fingers, severed tendons and deep cuts to the face, upper body or legs.

Multi-cutters

Most incidents have involved multi-cutters, which are tungsten tipped saw blades with a diameter of approximately 100mm. Photograph 1 shows a multi-cutter blade fitted to a 100mm angle grinder.

These discs were originally designed to be used on small power saws, not angle grinders. The injuries that can result from using multi-cutters on angle grinders are very serious. These injuries are more serious than those associated with conventional fibre re-enforced cutting discs, because:

- multi-cutters cut through materials at a faster rate
- multi-cutters are more prone to jamming and kickback
- the tungsten tips are sharper and generally cause a wider, deeper, and longer wound
- the tungsten cutting tips can fly off the blade at high speed when the multi-cutter is used as a grinding tool – due to the side loading applied to the blade
- vibration can cause the nut to loosen and allow the disc to be ejected at high speed.

Photograph 1 - multi-cutter fitted to a 100mm angle grinder

Blades and cup stones

Serious incidents with blades and cup stones include:

- abrasive cup stones exploding causing eye and penetration injuries, similar to bullet wounds
- concrete saw blades jamming on pipes or block work, causing kick-back that results in the worker being hit or cut.

Recommendations

Multi-cutters

1. Angle grinders fitted with multi-cutters should not be used unless they are fitted with full spring loaded guarding.
2. The multi-cutter blade is only used on suitable power tools in accordance with the instructions of a competent person.
3. The centre nut securing the multi-cutter blade should be regularly checked for tightness.
4. Multi-cutters must not be used for grinding due to the risk of tungsten cutting tips flying off the blade.

Photograph 2 - multi-cutter fitted with full spring loaded guarding (closed)

Photograph 3 - multi-cutter fitted with full spring loaded guarding (partially open)

Guards

Spring loaded saw guards, such as those on circular saws, are not readily available for angle grinders. One type of full guard currently available referred to as a hood guard for grinders is shown in photograph 2. A competent person should determine the suitability of the guard for their specific application.

Search the internet under 'hood guard for grinder' to locate a supplier.

General

The points below apply to the use of discs and blades on power tools and air tools.

- Discs and blades must be marked with the maximum permissible operating speed in revolutions per minute (RPM).
- The manufacturer of the disc or blade must supply information that describes the type of power tool or air tool that is suitable for the disc or blade to be attached to.
- The power tool is to be marked with the maximum operating speed in RPM and this speed must not exceed the maximum allowable speed marked on the disc or blade.
- The size of the cutting or grinding disc is not to exceed that specified by the power tool manufacturer.
- Guards should be provided on all power tools where there is a risk of the disc ejecting, disintegrating or cutting the worker. AS 1788, Abrasive Wheels, provides guidance on guarding abrasive wheels while AS/NZS 60745 Hand-held motor–operated Electric Tools - Safety requirements deals with the safety of grinders, polishers and disc-type sanders.
- Discs are installed correctly and the centre nut tightened in accordance with the power tool manufacturer's instructions.
- Exclusion zones must be set up around workers so that other persons cannot be injured if the worker loses control of the equipment, the disc disintegrates or is ejected.
- Workers must hold hand power tools with both hands as specified by the manufacturer. The worker should preferably stand with both feet on a level surface that is not slippery and operate the tool in front of the body. Heavy and powerful tools should not be used above chest height.
- Workers using a power or air tool must not wear loose clothing or jewellery and must securely tie back long hair so they cannot become caught in a moving part of the tool. Workers wearing protective clothing such as leather aprons and jackets additional to standard personal protective equipment will be better protected from injury when using power and air tools.

Guidance Note

Safe use of angle grinders

Practical advice for employers on controlling hazards when using angle grinders.

March 2011

Background

Angle grinders are versatile hand-held tools commonly used in the manufacturing industry, in particular the metal fabrication sector. Their ability to perform a variety of tasks is due to the different accessories that can be attached to them.

The type of attachment placed on an angle grinder depends on the task being performed and the materials being used. The most common uses for angle grinders include grinding (with abrasive discs) and cutting (with cut-off discs) – however attachments will vary depending on whether the operator is working with metal, stone, tiles or other materials.

Main hazards

The most common causes of injury to operators and nearby workers from angle grinders are lacerations from attachments that break and become projectiles, and lacerations from angle grinder kickbacks.

> Kickback happens when the angle grinder suddenly thrusts back towards the operator as a result of it grabbing or jamming on the materials being worked on.

Employers must provide a safe work environment for workers by implementing adequate controls to all identified hazards.

Before implementing controls, employers should consider:

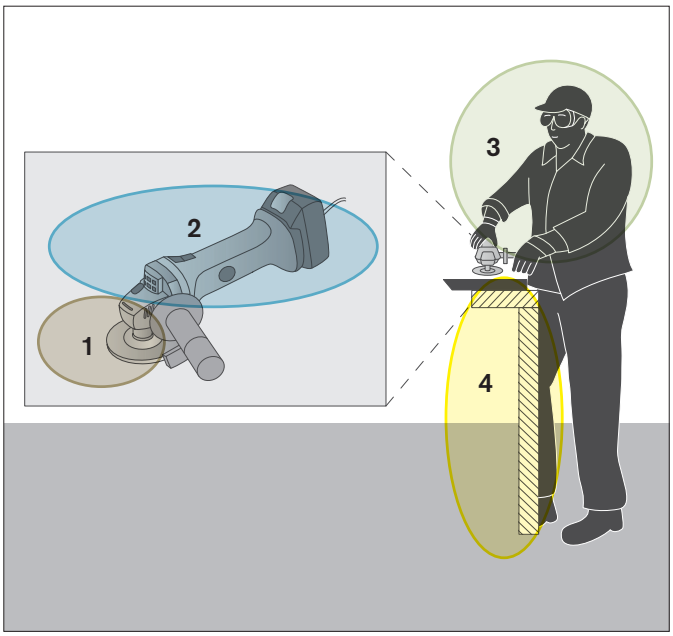
- if it is necessary to perform the task (eg if the weld will be hidden from sight and profiling is not needed for stress distribution, does it have to be ground?)
- safer ways to achieve the end outcome (eg using a bench-mounted saw for cutting).

When purchasing an angle grinder, the following safety features should be considered:

- anti-kickback safety clutch
- soft-start vibration reducing handle
- restart protection
- grinder fitted with braking system to rapidly stop the wheel
- noise-reduction grinding disk.

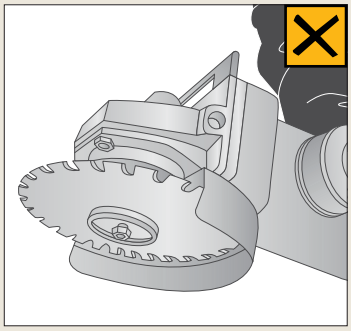
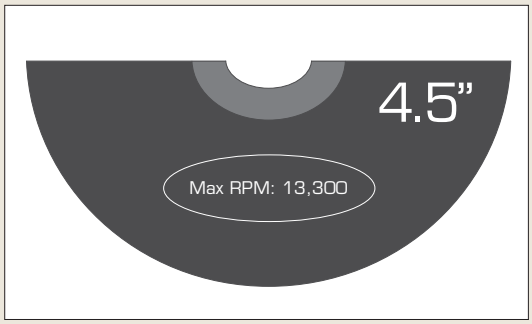
How to use the table

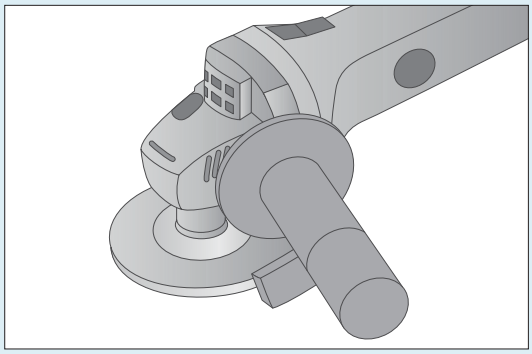
The table over the page lists and shows examples of the main hazards when using angle grinders. It also includes the possible consequence of the hazard and provides a list of recommended controls. The zone numbers in the table refer to what is shown in the picture below.



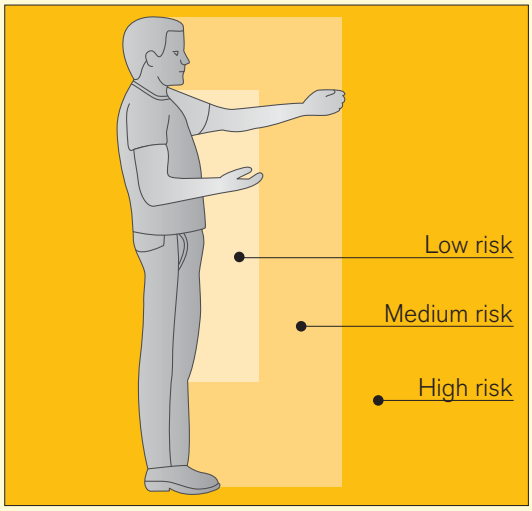
The zones of an angle grinder are:

1. angle grinder attachments
2. angle grinder
3. angle grinder operators
4. angle grinding workspace.

Hazard	Possible consequence	Recommended controls
Zone 1: Angle grinder attachments		
Attachments are inappropriate for the task (eg using an abrasive disc for cutting)	Kickback can occur or attachment can break, becoming a projectile and striking workers.	▪ Ensure the attachment selected is designed for the purpose it will be used (eg only use abrasive discs for grinding and cut-off discs for cutting).
Attachments that are not designed for angle grinders are used (eg using circular saw blades for cutting) 	Kickback can occur or blade teeth can detach at high speed, becoming projectiles and striking workers.	▪ Only use attachments designed for use on angle grinders. ▪ Do not use circular saw blades on angle grinders (see picture).
Attachment is not appropriate for the material being worked on (eg using a masonry cut-off disc on metal)	Attachment can break, becoming a projectile and striking workers.	▪ Clearly identify the material being prepared and ensure the attachment is appropriate. ▪ Identify any surface coatings that may be dangerous when worked on (eg lead).
Attachment is too large or small for the angle grinder	Attachment can break or detach from the angle grinder and strike the operator and nearby workers.	▪ Only use attachments designed for the size of the angle grinder used. ▪ Ensure the attachment centre hole matches the size of the angle grinder spindle.
The speed rating – revolutions per minute (RPM) – of the attachment is lower than the maximum speed of the angle grinder	Attachment can break, becoming a projectile and striking workers.	▪ Ensure the maximum speed (RPM) marked on the attachment is higher than the maximum speed of the angle grinder (see picture).  ▪ Do not use attachments that have decreased in size (through use) on small angle grinders.

Hazard	Possible consequence	Recommended controls
Attachments used are excessively worn or damaged	Warped or damaged attachments can cause excessive vibration, resulting in sprains and strains. Attachments can also break, becoming projectiles and striking workers.	▪ Before use, inspect attachments for excessive wear or damage. ▪ Discard worn or damaged attachments.
Guard has been removed or incorrectly positioned (eg removing the guard to use a larger attachment)	Debris or hot sparks fly back at the operator, causing burns or lacerations. Operator's hand makes contact with moving parts, resulting in amputations or lacerations.	▪ Never remove guards. ▪ Ensure guards are fitted securely in the correct position before use and are resistant to bending and twisting. ▪ Ensure the thickness and diameter of attachments is within the angle grinder ratings.
The flange and centre hole in the attachment are different sizes	Attachment can detach from the angle grinder's body and lacerate the operator and nearby workers. The angle grinder can also vibrate excessively, resulting in sprains and strains.	▪ Ensure the flange and hole in the attachment centre are the same size (eg buy inserts that provide the correct spindle hole).
Flanges and nuts are worn or damaged	Attachments can become projectiles if they detach from the angle grinder.	▪ Ensure flanges and nuts are free from wear tor damage before use. ▪ Discard worn or damaged flanges or nuts.
Zone 2: Angle grinder		
No auxiliary handle on angle grinder	Operators have reduced control of the angle grinder, which can cause lacerations as operators may be unable to stop the angle grinder making contact with them during kickback.	▪ Before use, ensure the auxiliary handle is attached. ▪ Ensure operators grip both handles during use. ▪ Ensure the handle is adjustable if there are multiple users (see picture). 
Outer body of angle grinder or electrical cord is damaged or has exposed wires	Operators can sustain an electric shock.	▪ Before use, inspect angle grinder body and leads for damage. ▪ Repair or discard damaged angle grinders. ▪ Use a safety switch or residual current device.

Hazard	Possible consequence	Recommended controls
No cut-off switch	Operators are unable to stop the angle grinder in an emergency.	▪ Ensure angle grinders have a cut-off switch.
Air vents are not regularly cleaned	Build up of dust and debris can cause the motor to short-circuit, resulting in an electric shock.	▪ Regularly clean air vents and maintain angle grinders in good working condition.
Zone 3: Angle grinder operators		
Operators are inexperienced (eg apprentices, trainees, young workers or experienced workers new to the task) or not trained in the safe use of angle grinders	Incorrect angle grinder or attachment may be selected (see consequences under Zone 1). Unsafe use of angle grinder can result in serious injuries to operators and nearby workers.	▪ Ensure operators are provided with training and supervision on the safe and correct use of angle grinders. ▪ Ensure operators demonstrate competency in performing the task safely.
Angle grinder is the incorrect size for the task	Operators can have difficulty controlling the angle grinder and may become injured if it moves suddenly (eg kickback).	▪ Only use angle grinders that are an appropriate size for the task.
Pressure is applied during operation	Attachments can break under pressure and strike workers. Excessive pressure can also increase the likelihood of kickback.	▪ Ensure operators do not apply pressure to the angle grinder during use.
Angle grinder is used in a wet environment	Operators can sustain an electric shock.	▪ Ensure operators do not use liquids when working with angle grinders. ▪ Ensure angle grinders are used in a dry environment.
Angle grinder is used before it reaches speed	Kickback can happen or attachments can shatter, resulting in lacerations.	▪ Before use, ensure operators allow the angle grinder to run to speed.
Angle grinders are placed on the ground or benches while still running	Angle grinders can move along a surface while running. The rotating parts can result in amputations or lacerations to nearby workers.	▪ Ensure angle grinders stop turning before being put down.
Running angle grinders are carried around the workplace	Moving parts can make contact with the operator or other workers, resulting in amputations or lacerations.	▪ Ensure angle grinders have stopped turning (eg parts are stationary) before they are moved around the workplace.

Hazard	Possible consequence	Recommended controls
Operator is positioned directly behind the angle grinder during use	Operator's ability to move out of the angle grinder's path during kickback is reduced.	▪ Ensure operators do not position their bodies directly behind the angle grinder when working.
Workers are exposed to extended periods of noise from angle grinders	Workers can sustain hearing loss.	▪ Ensure workers wear hearing protection. ▪ Ensure workers have audiometric testing when assessed as necessary.
No or inappropriate personal protective equipment (PPE) worn	Workers can sustain breathing difficulties from dusts or vapours. Workers can be struck by flying debris or hot sparks.	▪ Ensure operators and nearby workers wear appropriate PPE (eg hearing protection, safety goggles, face shield and fire-retardant clothing).
Zone 4: Angle grinding workspace		
Workpiece is not supported	Kickback can happen and the angle grinder can strike the operator.	▪ Ensure the workpiece is appropriately supported, considering its size, shape and the location of the angle grinder.
Workpiece is not secured and moves around	Workpiece can become a projectile, striking the operator and nearby workers.	▪ Ensure the workpiece is secured, considering the type of material, its shape and size (eg clamps).
Task is performed on the ground or requires awkward positions	Operators can sustain muscular sprains and strains to the back, neck, shoulders, arms and hands.	▪ Ensure workers only use angle grinders when required (eg if a welded join will not be seen on the final product and profiling is not required for stress distribution, using an angle grinder may not be necessary). ▪ Ensure, where possible, work is positioned in the operator's best working zone – between shoulders and knees (see picture).  ▪ Consider using mechanical aids to assist in performing tasks (eg jigs or robotics).

Hazard	Possible consequence	Recommended controls
Dusts or vapours remain in the work area when using angle grinders	Workers can experience breathing difficulties as the grinding of some materials, including those that have been coated in other substances, can create dangerous fumes.	▪ Ensure the work area is adequately ventilated (this may require natural airflow or extraction units). ▪ Ensure the work area is regularly cleaned and dusted.
Flammable substances near angle grinders	Substances can be ignited by angle grinder sparks, resulting in fires and burns to workers.	▪ Ensure flammable substances are not placed or stored in areas where angle grinders are used.
Untidy and unorganised work environment	Workers can slip or trip over workpieces, materials, leads and angle grinders.	▪ Ensure the work area is regularly inspected and dust and cuttings are cleared away. ▪ Ensure materials and workpieces not being used are stored until required. ▪ Ensure angle grinders are not stored on the ground. ▪ Ensure angle grinder leads are not too long.

Further information

Contact the WorkSafe Victoria Advisory Service on 1800 136 089 or go to **worksafe.vic.gov.au**

Related WorkSafe publications

A guide to safety in the metal fabrication industry

Metal Fabrication – Improving health and safety through layout and design

A Health and Safety Solution

Preventing misuse of angle grinders as saws

What is the problem?

Workers fitting saw blades to angle grinders and using them as cutting tools.

What are the risks?

The blade saw can jam or kickback (the disk thrusts back towards the user) and the exposed blade can strike the operator.

The blade's teeth or hardened tips can also become projectiles if they detach at high speed.

A worker was seriously injured while using an angle grinder fitted with a tungsten-tipped saw blade. The angle grinder was being used to cut a hole in the top of an aluminium fuel tank when the saw blade jammed, causing the angle grinder to kickback onto the worker.

Angle grinders are not designed to operate as power saws, as they:

- are not fitted with sufficient guarding to protect the operator if the blade jams, disintegrates or kicks back
- are not fitted with retractable guards that provide the same safety a power saw provides
- rotate at faster speeds and generate greater torque than power saws.

What is a solution to the problem?

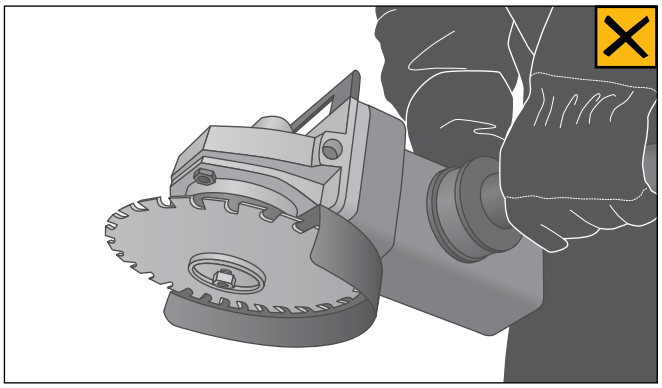
Put in place risk control measures to eliminate or minimise risks by:

- using the right tool for the job. Circular saw blades should never be fitted to an angle grinder
- only using blades specified by the manufacturer of the angle grinder (if in doubt, check with the manufacturer before fitting and using)
- using a safer alternative method of cutting for the task (such as a power drill, reciprocating saw, jigsaw with an aluminium blade or a purpose built cold metal cutting power saw)
- wearing appropriate hearing protection, safety glasses or a face shield when cutting or grinding. Flame-resistant clothing should be worn for hot work.
- ensuring workers are adequately trained in the safe use of angle grinders.

Further Information

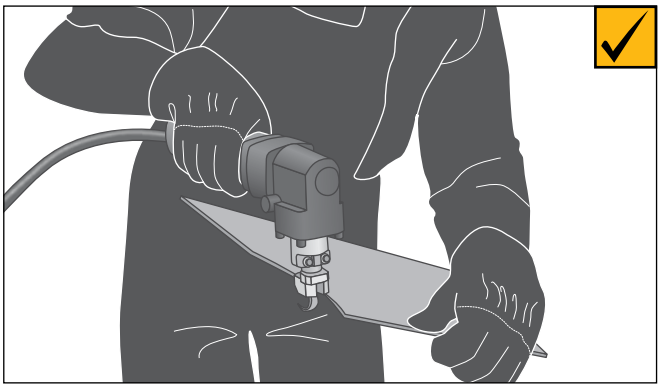
WorkSafe Advisory Service
Toll-free: 1800 136 089
Email: info@worksafe.vic.gov.au
worksafe.vic.gov.au

The problem



Circular saw blades should not be fitted to an angle grinder.

A solution



Only use angle grinders for the specific material and purpose for which they are designed.

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