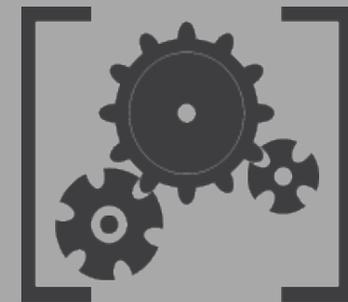
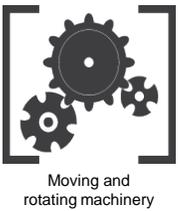




Safe Angle Grinding Guidance Note



Moving and
rotating machinery

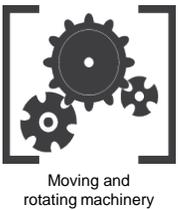


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● Background

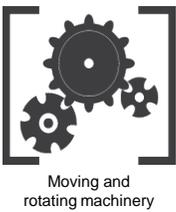
Angle grinders are versatile hand-held tools commonly used in the manufacturing industry, in particular the metal fabrication sector. Their ability to perform a variety of tasks is due to the different accessories that can be attached to them.

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.



Moving and
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Safe Grinding Guide



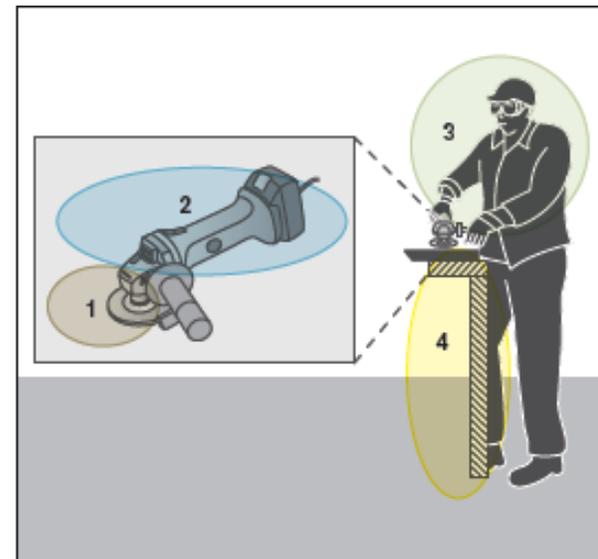
● Safe Grinding Assessment Table

How to use the Assessment 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.*





Moving and rotating machinery

Safe Grinding Guide



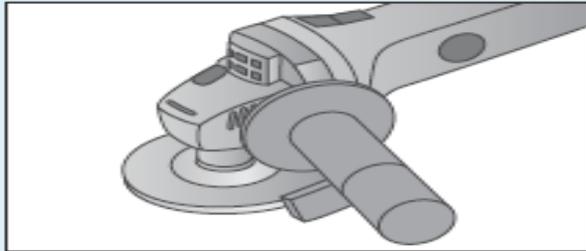
Hazard	Possible consequence	Recommended controls
Zone 1: Angle grinder attachments		
Attachments are inappropriate for the task (eg using an abrasive disc for cutting)	Kickback can occur or attachment can break, becoming a projectile and striking workers.	<ul style="list-style-type: none"> Ensure the 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Ensure the maximum speed (RPM) marked on the attachment is higher than the maximum speed of the angle grinder (see picture).  <ul style="list-style-type: none"> Do not use attachments that have decreased in size (through use) on small angle grinders.



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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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Ensure flanges and nuts are free from wear or 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Before use, inspect angle grinder body and leads for damage. • Repair or discard damaged angle grinders. • Use a safety switch or residual current device.



Moving and rotating machinery

Safe Grinding Guide



Hazard	Possible consequence	Recommended controls
No cut-off switch	Operators are unable to stop the angle grinder in an emergency.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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	<p>Incorrect angle grinder or attachment may be selected (see consequences under Zone 1).</p> <p>Unsafe use of angle grinder can result in serious injuries to operators and nearby workers.</p>	<ul style="list-style-type: none"> 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).	<ul style="list-style-type: none"> Only use angle grinders that are an appropriate size for the task.
Pressure is applied during operation	<p>Attachments can break under pressure and strike workers.</p> <p>Excessive pressure can also increase the likelihood of kickback.</p>	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Ensure angle grinders have stopped turning (eg parts are stationary) before they are moved around the workplace.



Moving and rotating machinery

Safe Grinding Guide



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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Ensure workers only use angle grinders when required (eg if a welded joint 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). <div data-bbox="1161 1066 1755 1430" data-label="Diagram"> </div> <ul style="list-style-type: none"> Consider using mechanical aids to assist in performing tasks (eg jigs or robotics).

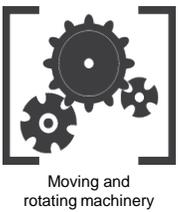


Moving and rotating machinery

Safe Grinding Guide



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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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.



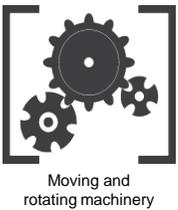
Safe Grinding Guide



● Safe Grinder Use Tips

How Can Grinding Risks be Minimized?

- Provide operators with training and instruction in safe work procedures for angle grinders.
- Consider whether an angle grinder is the best tool to perform the task as another tool may be just as effective.
- Do not use a larger, heavier or more powerful angle grinder than is necessary as it is much easier to control a lighter tool.
- When using an angle grinder ensure that the correct grinding disc is used for the type of task being performed. Never use discs that have not been designed for the type of tasks you are doing.
- Guards must not be removed. The guard should cover half of the disc and be positioned between the disc and the operator.
- Try to use a grinder that has an automatic cut-off or “deadman” switch as part of the handgrip. This is designed to cut off power as soon as finger pressure is released. Automatic cut-off switches may not be available on smaller models and may not be practicable for certain tasks.
- When purchasing a grinder, choose a grinder that has adjustable handles that can be moved to suit both left and right-handed operators.



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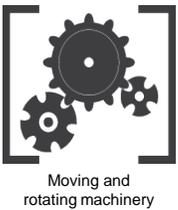


Before using an angle grinder, check to ensure that:

- The guard and handles are secure.
- The correct flange and locking nut is in place for the type of disc being used, otherwise the disc can shatter at high speed.
- There are no defects or damage to the disc. A disc which has been dropped may have developed cracks and should not be used.

When using an angle grinder:

- Use two hands to operate an angle grinder. One hand should grip the handle and “deadman” switch (if provided), while the other hand supports the weight of the tool.
- Allow the grinder to ‘run up’ to operating speed before applying it to the job.
- Hold the grinder against the work piece with minimum pressure, so the disc does not “dig in” and cause it to kickback.
- Never bump the grinder onto the object, or let the disc hit any other object while grinding.
- Keep the grinding disc at a 15 to 30 degree angle to the object. Ensure the work piece is held firmly, either as part of a larger item or in a bench vice.
- Where possible, keep the work at waist height during grinding.
- Adopt a comfortable stance with feet apart so you feel well balanced and ensure you have a clear view of the job.
- Never use a grinder between the legs while sitting on the floor.
- Stop at regular intervals for a short break to rest your hands and arms.
- Never put a grinder down until the disc stops rotating.
- Remove the plug from the power point before changing discs.



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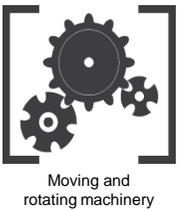


When using an angle grinder:

- Never use a cut-off wheel for grinding or a grinding disc for cutting.
- Disconnect the power and place the grinder on a bench with the disc facing upwards when not in use.
- Use appropriate Personal Protective Equipment (PPE). The following PPE are recommended:
Wide vision goggles, safety glasses with a face shield
- Ear muffs
- Safety boots with steel toecaps
- Overalls or other fitted clothing
- Well-fitted gloves that allow a good grip of the tool

Other Considerations

- One-on-one supervision needs to be provided for people receiving training in the use of angle grinders or who are unfamiliar with the use of angle grinders.
- Use welding screens to stop other workers being hit by flying particles and sparks.
- Ensure all workers maintain a safe distance from any person who is in the process of grinding.
- Ensure all angle grinders are regularly checked for electrical safety and that all defects are repaired by a licensed electrician.



Safe Grinding Guide



Appendix I Safe Grinding Tool Box Talk Example

Safe Use of Angle Grinders

Angle Grinders are sometimes used and safe use must be considered. The most serious injuries caused by Angle Grinders are from kick-back where the disc is thrust back violently towards the operator. Discs can shatter or explode sending pieces flying in all directions. Because angle grinders are designed for grinding and not for cutting, the use of cutting discs with angle grinders exposes operators to even greater risks.

Main Points

The minimum safety requirements for angle grinders should include the following:

Deadman or Paddle Switch (switch must have constant pressure)

Kickback Protection (if the disc jams – it stops)

Re-start Protection (prevents the grinder from unintentionally starting if power is temporarily lost)

Multi – position Locking Guard (positioned to protect the user)

Note: Angle grinders must always be used in conjunction with an industrial RCD.

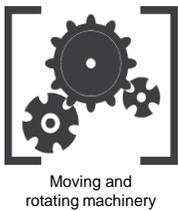
Further Safety Features recommended are:

Anti Vibration Handles

Soft start up

Multi – position handles

Electronic overload protection



Safe Grinding Guide



Appendix I Safe Grinding Tool Box Talk Example

Safe Use of Angle Grinders (cont.)

Wheel Safety:

Cutting wheels or discs should not be used for grinding jobs, and grinding wheels should not be used for cutting jobs.

Wheels designed for a particular revolution speed should not be used on machines of different speeds.

Wheels should be used only for the specific material and purpose for which they are designed, and according to the manufacturer's recommendations.

Wheels worn down through use should be discarded and NEVER used on smaller machines.

If subjected to excess pressure wheels can shatter at high speed, exposing the users and others close by to the risk of serious injury.

Discussion Points

Users of Angle Grinders must:

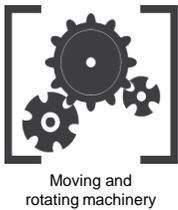
Be trained in their safe use

Check the disk is appropriate for the work intended and it is fitted correctly.

Wear the appropriate PPE: safety glasses with face shield, gloves, hearing protection, safety footwear, high visibility vest or clothes, and protective overalls.

Check for others in the vicinity and ensure safe distances are maintained.

Remain on fire watch for a period of 30 minutes following conclusion of the work if there is a risk of sparks igniting material.



Safe Grinding Guide



Appendix I Safe Grinding Tool Box Talk Example

Safe Use of Angle Grinders (cont.)

Discussion Points

Questions and Answers

Q. Name the items of PPE required when you are using an angle grinder.

A. Should include: Gloves, Safety eyewear or Face shield, Hearing Protection, Safety Footwear, High Visibility Clothing or Vest, Protective Overalls.

Q. What are the four minimum safety requirements that must be features of the Angle Grinder?

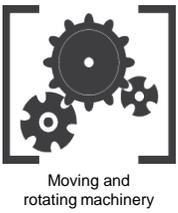
A. Deadman or Paddle Switch, Kickback Protection, Re-start Protection, Multi-position Locking Guard.

Q. What must you do with worn wheels?

A. They must be disposed of, and not kept for use on a smaller grinder.

Q. What causes the most serious injuries when using an angle grinder?

A. Kick back, where the disc is thrust back violently towards the operator. I



Safe Grinding Guide



Appendix I Safe Grinding Tool Box Talk Example

Safe Use of Angle Grinders (cont.)

Acknowledgement of tool box talk

I have read / heard and understand the information in this Tool Box Talk, I will ask my Manager or an EQR staff member if I have any questions.		
Name	Date	Signature

Appendix II PPE

Face and eye protection examples:

- Full face protection - Good Practice

