Background

Employers must ensure employees' exposure to noise does not exceed the exposure standard by implementing the following hierarchy of control measures:

- eliminate the source of noise
- substitute noisy plant for quieter plant or processes or implement engineering controls
- use administrative controls
- provide hearing protection.

The noise exposure standard set out in the Occupational Health and Safety Regulations 2017 is an 8 hour average of 85dB (A) and a peak noise level of 140dB(C) at the employee's ear position. Workplace noise that exceeds the noise exposure standard is considered dangerous to employees and must be controlled in accordance with the hierarchy of control.

Employers must apply each level of the hierarchy so far as is reasonably practicable before moving down to the next control measure. This means that an employer cannot go straight to hearing protection without first implementing higher level control measures so far as reasonably practicable.

Often a combination of control measures are required to effectively control risks associated with workplace noise.

Circular saws

Circular saws are widely used in workplaces to cut metal, plastic, wood and masonry. They can be portable saws (eg drop saws), hand-held and fixed saws (eg panel saws), docking saws or beam saws.

Noise levels generated by circular saws can vary from 80dB(A) up to 120dB(A), depending on the type of saw and the material being cut. Other variables include saw blade diameter and thickness, number of teeth, tooth design, gap between teeth (i.e. gullet), level of damping, speed of blade, feed rate and the condition of the saw.
Circular saw noise
Circular saws produce noise while idling, cutting and due to vibration of the work-piece (e.g., metal).

- **Idling or free-running noise** is associated with air turbulence caused by the saw teeth and gap between teeth (gullets). The larger the gullet size, the more noise is created. The air turbulence also causes the saw to vibrate and produce a ringing (resonance) or hissing sound.

A saw idling can produce noise levels of around 90-95 dB(A) and therefore contribute significantly to employee exposure to noise without any material being cut.

- **Cutting noise** is produced as a result of the impact of saw teeth on the material being cut. Less noise is produce if there are more and smaller teeth on the saw blade as the impact force per tooth is reduced. The impact also causes the saw to vibrate and generate noise.

- **Work-piece vibration** can be a significant source of noise when cutting plastic or metal if the work piece is not suitably clamped or damped. Cutting aluminium extrusions generates particularly high levels of noise which vary with the profile of the extrusion.

By measuring or observing the noise levels at each stage of the cycle (e.g., idling, cutting), the dominant noise source can be identified and the most appropriate control measure used.

Control measures
A wide range of noise control measures can be applied to circular saws to achieve noise reductions ranging from 3-20dB(A) or more. Suitable control options may include the following:

**Eliminate the use of saws,**
You can eliminate the need to use saws in the following ways:

- purchase pre-cut or pre-fabricated materials (e.g., timber, metal, stone) to eliminate the need to use a circular saw
- use a quieter cutting process such as a guillotine or power hack saw.

**Substitute noisy circular saws for quieter ones**
Choose a saw with a quieter motor and a saw blade that has:

- the greatest number of teeth, and the smallest teeth suitable for the job
- the smallest possible gullets
- built-in vibration damping (laser cut slots or laminated blade construction) – see below
- tungsten carbide tipped (TCT) teeth which stay sharper longer and can reduce cutting noise by up to 14 dB(A).

- **Figure 5:** Tips for choosing a quiet saw blade
- **Figure 6:** Saw with teeth missing to dampen noise.
Ref. WorkSafe New Zealand, Noise abatement for circular saws
Use engineering controls such as:
- full or partial acoustic enclosures
- barriers, partitions or screens to shield nearby employees
- damping collars on existing blades to reduce vibration
- installing isolation mounts and positioning the saw on a stable surface such as concrete
- placing a rubber mat under bench mounted saws, such as portable cut-off saws to minimise vibration of the bench
- firmly bolting the saw in place so vibrations are minimised
- using foam inside guarding panels on pendulum cross-cut saws
- minimising gaps, dampen or isolate panels and line them with sound absorbing materials on beam saws
- using manual or pneumatically operated padded clamps on either side of the cutting point
- lining the feed table with foam or mineral wool.

Use administrative controls, for example:
- do not leave saw idling unnecessarily
- use a lower operating speed (a 25% and 50% reduction in rpm may reduce noise levels by 6-8 dB(A) and 15dB(A), respectively)
- schedule noisy cutting work to occur at times when the least number of employees are in the area
- use job rotation to reduce duration of employee exposure
- ensure employees do not use excessive pressure when cutting
- keep cut depth to a minimum
- locate saws in a separate room or in an isolated area to minimise exposure to other employees - doubling employees distance from a saw can reduce noise up to 6dB.

**Maintenance of saws**

Maintenance is critical to the reduction of circular saw noise. Therefore:
- keep blades sharp. Noise reductions of up to 10dB(A) have been reported by sharpening a blade or using sharp tungsten carbide teeth
- tighten any loose parts (eg belts, blade covers) to ensure they do not rattle or vibrate
- maintain saws (including the motor) in good condition through regular servicing and replacement of worn bearings, brushes and belts
- test the main shaft bearings for wear by twisting the blade from side to side.

**Saw blade vibration damping**

Damped blades can significantly reduce noise while the saw is idling and in use. Effective damping of saw blades may achieve reductions of 6-17dB(A). Damping collars should be at least one-half of the blade diameter to be effective. Saw blade damping can be in the form of:
- deep slots built into the saw, missing teeth or deeper gullets (see figures 5 and 6)
- internal damping layers built into the blade (ie sandwich laminate blades)
- damping material sandwiched between concave steel plates (see figures 7 below)

Using two parallel sheets of 18mm particle board on each side of the blade and as close as possible to it have shown good results with idling noise reductions of up to 17dB(A) and some reduction in cutting noise.

![Diagram of saw blade damping](image)

**Figure 7:** Saw blade damping (clamped damping layer)

Ref. WorkSafe New Zealand, Noise abatement for circular saws
The following table shows the effect of different saw blade features on sound levels at operator position.

<table>
<thead>
<tr>
<th>Saw blade parameter</th>
<th>Sound Level (reduction dB(A))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smaller &amp; more teeth</strong> Cutting lengths of aluminum using tungsten blade (350mm)</td>
<td></td>
</tr>
<tr>
<td>84 teeth, 3.5 mm wide</td>
<td>97</td>
</tr>
<tr>
<td>108 teeth, 3.2 mm wide</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>-6 dB(A)</td>
</tr>
<tr>
<td><strong>Vibration dampening</strong> Cutting brick using 350mm masonry blade (20 teeth)</td>
<td></td>
</tr>
<tr>
<td>Standard blade</td>
<td>94</td>
</tr>
<tr>
<td>Damped blade</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>-10 dB(A)</td>
</tr>
<tr>
<td><strong>Idling noise (free running)</strong> – more smaller gullets</td>
<td></td>
</tr>
<tr>
<td>84 gullets, 10mm x 7mm</td>
<td>91</td>
</tr>
<tr>
<td>108 gullets, 8mm x 4mm</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>-7 dB(A)</td>
</tr>
</tbody>
</table>

Table 1: Ref. WorkSafe Western Australia Engineering Noise Control Reports No's ENC-2-93, ENC-4-93

Rapid access during operation

1. Workpiece clamps
2. Sound deadening table
3. Windows
4. Lights
5. Small apertures

Extensive access for cleaning and maintenance

1. Workpiece clamps
2. Sound deadening table
3. Windows
4. Lights
5. Small apertures
6. Light-gauge perforated steel sheet
7. Sound absorptive material
8. Solid outer skin 12mm timber board
9. Sheet Steel 1-2mm or similar

Figure 8: Circular saw enclosure. Ref. WorkSafe New Zealand, Noise abatement for circular saws
Information about Noise Control – Circular Saws

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

WorkSafe Publications
- Noise Control – A step by step approach
- Noise Control – Circular saws
- Noise Control – Compressed air noise
- Noise Control – Enclosures, barriers and screens
- Noise Control – Fan and ventilation noise
- Noise Control – Grinders
- Noise Control – Hearing protection
- Noise Control – Impact, vibration and materials handling noise

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This guidance has been reviewed and updated for the sole purpose of amending year and regulation references relating to the Occupational Health and Safety Regulations, in line with amendments which came into effect on 18 June 2017.