A Practical Guide for Assessing Noise Generated by Plant or Equipment in the Workplace
Foreword

This practical guide for carrying out a noise assessment has been developed by the National Acoustic Laboratories in conjunction with WorkCover NSW and industry to give the users of plant or equipment an indication as to the possible noise exposure risk when the item is used in the workplace and the action that should be taken in order to control that risk. This guide can be used in conjunction with other awareness and training programs required by Work Health and Safety (WHS) legislation and associated Codes of Practice.
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1. Background

Occupational noise-induced hearing loss (NIHL) is a major compensable industrial disease in Australia and incurs substantial economic costs. Exposure to excessive noise also involves large unrecognised costs to organisations by way of increased employee turnover and absenteeism, lowered performance and may contribute to industrial incidents.

As well as the economic cost to employers, NIHL imposes a severe burden on Australia’s health and social services and the economy as a whole.

To the individual, the effects of NIHL can lead to loss of the ability to hear, tinnitus and lack of social interaction, reduced quality of life (impairment of relationships and social isolation) and potential for further health problems such as quickened pulse rate, increased blood pressure and a narrowing of blood vessels.

As the effects of noise may not be instantly recognised and in most cases do not become evident until later life, we all have an obligation to control noise by either eliminating or at least minimising the effects of noise in the workplace.

2. Purpose

The purpose of this document is to provide a guide for a simplified assessment method for a person conducting a business or undertaking (PCBU) and others to evaluate the approximate sound exposure of plant or equipment when it is used in the workplace. As a result of this assessment, appropriate control measures can be provided to better protect workers from the harmful effects of noise.

This guide can be used in conjunction with other awareness and training programs required by Work Health and Safety (WHS) legislation and Codes of Practice.

NOTE: Throughout this guide, the reference to plant or equipment includes the following:

- Mobile plant or equipment
- Fixed plant or equipment
- Powered hand tools both fixed and mobile
- Other plant or equipment in the workplace that emits noise levels above the legal limit.

3. Definitions

Emission means radiation of sound from a sound source.

Excessive noise means the noise above the noise exposure criteria as set by the relevant statutory authorities or by the organisation’s noise policy, whichever is the lower.

Exposure means the presence of a person at a point of immission.

Immission means the influx of sound at a point.

Noise means all sound in the workplace, whether wanted or unwanted.

(AS/NZS 1269.0:2005)
4. Legislative requirements

The WHS legal requirements of different State legislations currently vary slightly. From January 2012, uniform WHS Act and WHS Regulations will come into effect throughout Australia.

WHS Regulations will require PCBUs to ensure that the noise that a worker is exposed to at the workplace does not exceed the exposure standard for noise.

The exposure standard for noise means:

- For continuous noise, noise levels that are equal to or greater than an 8-hour noise level equivalent \( (L_{Aeq,8h}) \) of 85 dB(A), or
- For impulse noise, noise levels that are equal to or greater than a peak \( (L_{C,peak}) \) of more than 140 dB(C).

Current NSW OHS Regulation 2001 covers the control of noise levels to which a worker is exposed by taking measurements in accordance with AS/NZS 1269.1.

The following guide covers the measurement of the level of noise at its source. Once the level of noise output is determined, control measures can be provided to either eliminate or reduce the harmful effects of the noise.

5. When to test

Plant or equipment noise level should be tested:

I. before plant or equipment is used to conduct work at a workplace and/or
II. when there is a substantial change to plant or equipment in use at a workplace, and/or
III. where the position of the plant or equipment is used in a substantially different environment to that when it was last tested, and/or
IV. whilst in use at determined intervals, and/or
V. upon notification of incident related to noise.

6. Who can carry out the test

The person carrying out the tests described in this guide should be competent in the use of a Sound Level Meter (SLM). This could be achieved by receiving verbal or written instructions from the manufacturer/supplier of the SLM as specified in the associated user manual. The person should also be familiar with the requirements of this guide.

7. Procedure

7.1. Environment

Situations may vary site by site but for testing, ideally the plant or equipment should be placed on a solid operating surface and in a typical environment similar to that in which it is to be used, with both the distance from hard reflective surfaces and location with respect to other operating plant or equipment considered. However, for practical reasons, the above
conditions may not be feasible, therefore, at the very least, the plant or equipment could be placed on a solid surface such as concrete.

7.2. Operation

The plant or equipment should be operating under load conditions in a similar manner as it would be expected in the workplace. With plant or equipment that incorporate different attachments, the tests should be carried out with the noisiest attachment to be used at the workplace.

7.3. Measurement

All measurements should be conducted using a Class II Sound Level Meter (SLM) or equivalent/better according to International Standard AS IEC 61672. The measurements taken should be equivalent continuous, A-weighted sound pressure level (\(L_{Aeq}\)) as defined in AS/NZS 1269.1.

- Establish area for test where workers are not exposed to noise levels generated by testing activities.

- Noise measurements should be taken at a horizontal distance of approximately 3.0 m from the plant or equipment at 1.2 m above ground at four evenly spaced positions around the perimeter of the plant or equipment while in operation (refer to Appendix B for diagram).

- If the plant or equipment must typically have an operator present, then an additional noise measurement to determine the exposure levels should also be made at the operator's ear.

- The SLM should be set to record the \(L_{Aeq}\) parameter.

- With the plant or equipment operating, the microphone of the SLM should be directed towards the plant or equipment and a reading taken at each designated measurement position.

- The sample time for taking measurements should be representative of the time or work cycle taken to carry out a typical task by the machine. For example if measuring a concrete saw the sampling time should last as long as a typical operational cycle including quieter and louder times. For a continuous operation, such as a compressor, a suitable sample time may be between thirty seconds and one minute.

- Situations where a breeze is blowing over the microphone should be avoided as this has the potential to significantly add to the measured noise level.

- Background noise levels should be at least 10 dB less than the measured noise level. Loud background noise levels can add significantly to the noise level being measured.

- Measurements should be within + or – 3dB.

- The tests should be carried out on an individual item of plant or equipment. If multiple items of plant or equipment are being operated in an area, more complex tests may be required by a noise monitoring professional.
7.4. Determining the output

The sound output of the plant or equipment is declared to be the highest of all the readings however, if the operator is normally positioned in an enclosed sound protected cabin, the highest external reading should be used.

NOTE: This will be considered to be an approximate value of the operating noise level of the plant or equipment for survey purposes within 3 dB. If precise measurements are required the appropriate Australian Standards should be consulted.

7.5. Results

If the average $L_{Aeq}$ is:

- less than 85 dB, then the plant or equipment should be labelled using the green coloured label (refer to Appendix A), or
- equal to or greater than 85 dB, then the plant or equipment should be labelled using a red coloured label (refer to Appendix A).

8. Records

Records should be kept of the results taken when testing plant or equipment.

Records should include the following information:

- The date the test was carried out.
- Test site address
- Controller of the site
- Identification of the plant or equipment (Type, Make and Serial/Plant or Equipment ID Number)
- Name, position and employer of person carrying out test
- Test location within the site
- Owner of plant or equipment
- Sound level meter used (Type and Serial Number)
- Test results
- Recommended type of label to be affixed to the plant or equipment
- Recommended control measures

A sample of a record of test can be found in Appendix B.

9. Control measures

Where it is found that the plant or equipment emits a noise level in excess of 85dB(A), control measures should be provided as per the Noise Management and Protection of Hearing At Work WorkCover Code of Practice or equivalent to ensure that persons are not exposed to the harmful noise levels.

If practicable, eliminate plant or equipment that emits a noise level in excess of 85dB(A) from the workplace. For example, by having a noise policy with a “buy quiet plant or equipment” requirement.
To control the noise in the first instance, try reducing the noise at the source (preferred solution). If that is not possible or practicable then (in order of preference):

- Use alternate plant or equipment that generates less noise;
- Enclose noisy plant or equipment;
- Relocate plant or equipment to another less frequented area;
- Make sure that all noise-suppressing features, such as mufflers, are working and are maintained;
- Increase the distance between persons and the source of the noise;
- Limit the number of persons working in the vicinity of the source of the noise;
- Provide a barrier between the plant or equipment and persons working in the vicinity; and
- As a last resort provide appropriate personal hearing protectors to all persons in the vicinity of the source of the noise.

10. Personal hearing protectors

It is essential that where, as a last resort, personal hearing protectors are relied upon to control noise, they must be of a type and class that is appropriate for the level of noise produced by the plant or equipment (see AS/NZS 1269.3) combined with appropriate information, instruction and training given to all users.

10.1. Guidance in the classes of hearing protectors

<table>
<thead>
<tr>
<th>Noise level (LAeq,8h, dB(A))</th>
<th>Class of hearing protector required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 90</td>
<td>1</td>
</tr>
<tr>
<td>90 to less than 95</td>
<td>2</td>
</tr>
<tr>
<td>95 to less than 100</td>
<td>3</td>
</tr>
<tr>
<td>100 to less than 105</td>
<td>4</td>
</tr>
<tr>
<td>105 to less than 110</td>
<td>5</td>
</tr>
<tr>
<td>For levels greater than 110</td>
<td>Seek specialist advice.</td>
</tr>
</tbody>
</table>

(AS/NZS 1269.3)
Appendix A  Labels

The suggested method of labelling plant or equipment to indicate the approximate level of noise it generates in operation is by affixing a coloured label at a prominent location on the plant or equipment itself.

Where the reading is less than 85 dB, then the plant or equipment should be labelled using the green coloured label with no specific noise exposure precautions required for usage of less than 8 hours.

Where the reading is equal to or greater than 85 dB, then the plant or equipment should be labelled using the red coloured label and the operator should wear hearing protectors. In addition, those persons working within 5m of the plant or equipment should also wear hearing protectors or take other appropriate control measures to protect against noise.

Suggested format for these labels comes in the following two colours and shapes:

**Green rectangle:** where the level of output noise is less than 85 dB

**Red circle:** where the level is equal to or greater than 85 dB

![Noise Advice Label](image1)

![Noise Warning Label](image2)

**NOTE:** The output sound level measured should not be recorded on the label as it is considered to be an approximate level only.

Provisions applicable to Work Health and Safety (WHS) legislation in conjunction with the appropriate Code of Practice apply at all times. The labelling does not replace any relevant WHS Regulation or Code of Practice requirements. Rather, the suggested labelling acts as a visual reminder that control measures are required to protect against harmful noise.
Displaying the label

The label should be affixed in prominent, protected positions on the plant or equipment using adhesive or other methods (e.g. magnets).

Where this is not possible, because of the size of the plant or equipment, label should be affixed in a prominent position on the carrying case or box.

The labels can be provided in different sizes (e.g. A5, A4, A3 or other). They should be of robust composition able to sustain damage associated with wear and tear in workplaces.

For smaller plant or equipment (e.g. angle grinders), alternatives to labels such as tags displaying the green or red image can be used.
# Appendix B   Sample noise assessment test record

<table>
<thead>
<tr>
<th>Test date:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Test site address:</td>
<td></td>
</tr>
<tr>
<td>Controller of the site:</td>
<td></td>
</tr>
<tr>
<td>Plant or Equipment details</td>
<td></td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Make:</td>
<td></td>
</tr>
<tr>
<td>Serial/Plant or Equipment ID Number:</td>
<td></td>
</tr>
</tbody>
</table>

| Name, position and employer of person carrying out test: | |
| Test location within the site: | |
| Owner of Plant or Equipment: | |
| Sound level meter used |
| Type: | |
| Serial Number: | |

**Test Results:**
1. First Position
2. Second Position
3. Third Position
4. Fourth Position
5. Operator’s ear
6. Determined output (max sound level recorded for all of above.)

**Recommended Label (tick box):**
- Green - Less than 85 dB
- Red - Equal to or greater than 85 dB

**Recommended Control Measures:**

<table>
<thead>
<tr>
<th>1st Reading</th>
<th>2nd Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PLANT OR EQUIPMENT Reading at the operator’s ear</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3rd Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>3 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4th Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>3 m</td>
</tr>
</tbody>
</table>

Note: all readings are taken 1.2m above the operating surface.
### Appendix C  Noise card

<table>
<thead>
<tr>
<th>Activity</th>
<th>Activity Description and Noise Level</th>
<th>Activity</th>
<th>Activity Description and Noise Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Conversation</td>
<td>60 decibels</td>
<td>Operating a Grinder</td>
<td>97 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>More than a day</td>
<td>Max. Time of Exposure</td>
<td>30 Minutes</td>
</tr>
<tr>
<td>Driving a Vehicle</td>
<td>70 decibels</td>
<td>At a Rock Concert</td>
<td>100 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>More than a day</td>
<td>Max. Time of Exposure</td>
<td>15 Minutes</td>
</tr>
<tr>
<td>Standing on a Busy Road</td>
<td>80 decibels</td>
<td>Near a Crane</td>
<td>102 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>24 Hours</td>
<td>Max. Time of Exposure</td>
<td>10 Minutes</td>
</tr>
<tr>
<td>Inside a Noisy Restaurant</td>
<td>84 decibels</td>
<td>Operating a Jackhammer</td>
<td>105 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>10 Hours</td>
<td>Max. Time of Exposure</td>
<td>5 Minutes</td>
</tr>
<tr>
<td>Operating a Welder</td>
<td>85 decibels</td>
<td>Operating a Bulldozer</td>
<td>107 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>8 Hours</td>
<td>Max. Time of Exposure</td>
<td>3 Minutes</td>
</tr>
<tr>
<td>Operating a Lawnmower</td>
<td>91 decibels</td>
<td>Using Explosive Power Tool</td>
<td>120 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>2 Hours</td>
<td>Max. Time of Exposure</td>
<td>10 Seconds</td>
</tr>
<tr>
<td>Operating a Power Tool</td>
<td>94 decibels</td>
<td>Near Diamond Rock Saw</td>
<td>121 decibels</td>
</tr>
<tr>
<td>Max. Time of Exposure</td>
<td>1 Hour</td>
<td>Max. Time of Exposure</td>
<td>5 Seconds</td>
</tr>
</tbody>
</table>
Appendix D  Noise decay with distance

Everyone knows that as you move away from a noisy machine the sound level becomes less the further you move away. In an open area the sound decays faster as compared to, say a machine located on a multi-story construction site on a concrete floor and beneath a ceiling slab with no walls. In the open space the decay rate is 6 dB while between the slabs it will be 3 dB per doubling of distance. Consider, for example, a power tool that is 100 dB at the operator’s position. The decay rate is given by the following table:

<table>
<thead>
<tr>
<th>Location</th>
<th>1m</th>
<th>2m</th>
<th>4m</th>
<th>8m</th>
<th>16m</th>
<th>32m</th>
<th>64m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open space</td>
<td>100 dB</td>
<td>94 dB</td>
<td>88 dB</td>
<td>82 dB</td>
<td>76 dB</td>
<td>70 dB</td>
<td>64 dB</td>
</tr>
<tr>
<td>Between slabs</td>
<td>100 dB</td>
<td>97 dB</td>
<td>94 dB</td>
<td>91 dB</td>
<td>88 dB</td>
<td>85 dB</td>
<td>82 dB</td>
</tr>
</tbody>
</table>