

MODULE 5: USING SURVEYS

THIS MODULE IS FOR Noise managers
Production/engineering staff
Employee representatives
OHS committees.

OUTCOMES Once a noise survey report has been prepared for a workplace, the noise manager should be able to:

- define which parts of the workplace and workforce have been surveyed;
- identify which employees are likely to be exposed to noise above the exposure limits;
- describe the conditions under which the plant was operating at the time of the survey, comment on whether or not this was typical, and estimate the likely effects of other normal operating conditions;
- assess the level of risk of employees suffering a noise-induced hearing loss;
- identify in which areas, during which operations, or at which machines the employees are receiving the most significant noise exposures;
- provide relevant information to both management and employees as to noise in the workplace, as part of a noise education programme;
- select appropriate personal hearing protection for employees in noisy areas;
- define any remaining legal obligations which the employer (or employees), may have to fulfil.

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SUMMARY

UNDERSTANDING AND USING NOISE SURVEY REPORTS

PURPOSE OF A NOISE SURVEY

A noise survey report is first and foremost a springboard for action. It provides the basic technical information about the workplace to enable you to take the actions listed under OUTCOMES on the previous page. The noise survey report contains measurements of the noise levels (especially the A-weighted noise levels) to which operators are exposed and estimates of their typical daily noise exposure levels. The report may cover the whole workplace or only part of it (for example, the machine shop or a new vehicle).

It may have been prepared in response to the need to comply with the law or in response to a request from the employees for information on noise levels.

A noise survey report is not a noise control plan (see Step 4 of the Core) or a noise policy (see Step 3 of the Core and *Module 7: Noise Policy*) for your workplace. These need to be developed from the information in the noise survey report.

Above all, the noise survey report should not be seen as a menu for personal hearing protectors as though this were the end point of your noise management planning.

A noise survey report is unlikely to be written in a form suitable for presentation “as is” to management and employees. Relevant information will need to be extracted and presented in a different format. For example, the noise level results may need to be transferred onto a wall chart to show noise levels in various areas, with a “temperature scale” to show what the noise levels mean.

WHAT YOU NEED TO USE A SURVEY

Firstly, you need a basic grasp of noise terminology and how noise surveys are carried out. Appendices 1 and 2 of the Core list some of the terms you should know. For further reading on noise measurement, see Bruel and Kjaer Ltd.’s booklet *Measuring Sound* (Denmark, 1984) available from Reid Technology Ltd, PO Box 1898, Auckland. The methods of noise measurement and the basis of calculations used in noise survey reports are

detailed in Australian Standard AS1269 *Acoustics - Hearing Conservation*, available from Standards New Zealand.

Secondly, you need a grasp of the regulation on occupational noise. Approach the Occupational Safety and Health Service to find out their requirements. They may have booklets or run short seminars explaining the legislation.

**DEFINE SCOPE
OF SURVEY**

The noise survey report should clearly set out, at the beginning, which parts of the workplace or workforce have been surveyed. For example:

This noise survey report on XYZ Bakery covers the main baking hall and adjoining preparation areas. There are approximately 80 staff employed in this area, including plant operators, packers and supervisors. The survey did not include the following people who are to be the subject of a later survey:

- laboratory and technical staff;
- workshop and maintenance staff;
- drivers and vendors;
- office staff.

**IDENTIFY
EXPOSED
EMPLOYEES**

Employees likely to be exposed to noise above the exposure limit should be identified.

In small workplaces, the noise survey report may list all employees likely to be exposed above the exposure limit. In medium to larger workplaces, this may have to be estimated from the results in the report. For example, if the report contains an assessment of two plant operators, both of whom are exposed to noise above the exposure limit, then it can be assumed that the other eight operators performing similar tasks may also be exposed to noise above the exposure limit.

If noise exposures vary a lot over the day, or from day to day, it is often possible to estimate an employee's typical 8-hour average exposure from the results in the report.

<i>Machine/Process</i>	<i>Noise Level at Operator's Ear</i> $L_{Aeq,T}$ (dB(A))
Angle grinder	104
Power hacksaw	88
Chipping hammer	98
Welding	93
Ambient noise	85

You now estimate the typical duration for which the employee is likely to operate those items in a typical “worst case” day, that is, angle grinder 1 hour, hacksaw 1.5 hours, hammer 0.5 hour, welding 2 hours and ambient noise for remainder of day (3 hours). As described in Appendix 2 of the Core of this Control Guide, use Table 3 to assign a PNE to each of the above combinations of noise levels and durations as demonstrated in the following table:

<i>Machine/process</i>	<i>Noise level</i> $L_{Aeq,T}$ (dB(A))	<i>Duration</i> (hrs)	<i>Partial noise exposure</i> (Pa ² h)
Angle grinder	104	1.0	10.0
Power hacksaw	88	1.5	0.4
Chipping hammer	98	0.5	1.3
Welding	93	2.0	1.6
Ambient noise	85	3.0	0.4
Daily Noise Exposure = sum of partial noise exposures =			13.7

The daily noise exposure is simply converted to the equivalent 8-hour noise exposure level using the same process in reverse.

$$L_{Aeq,8h} = 96 \text{ dB(A)}$$

This value is then compared with the exposure limit.

The above example shows that it is possible to estimate an employee’s noise exposure for a given day’s duties, knowing the noise levels and duration of the various tasks.

Sometimes, however, an employee’s exposure is likely to be so variable that a typical duration for each task

cannot be assigned. In this case, it is often possible to assess the likelihood that the noise exposure exceeds the exposure limit. This can be done by taking the noise level results in the report and calculating the duration for which one operation would need to be carried out to cause the exposure limit to be exceeded. To do this, use Table 3 in Appendix 2 of the Core in the following way:

- look up the Pa^2 value for the noise level, (X);
- divide 1 by this value (1/X);
- the result is the time in hours beyond which the exposure limit will be exceeded.

Example (the exposure limit is $L_{Aeq,8h}$ 85 dB(A))

<i>Machine/process</i>	<i>Noise level</i> $L_{Aeq,T}$ (dB(A))	<i>Time for exposure limit</i> <i>to be exceeded</i>
Angle grinder	104	6 mins
Power hacksaw	88	4 hrs
Chipping hammer	98	24 mins
Welding	92	1.6 hrs
Ambient noise	85	8 hrs

Knowing that the employee is likely to spend at least 6 minutes per day on the angle grinder, apart from other noise exposure during the day, indicates that the employee’s exposure is likely to be above the exposure limit.

Note that there may be employees who spend time in the area without operating the machines (for example, other staff and cleaners). You could assume that these employees are exposed to the “ambient level” given in the example.

Remember that exposure limits are also expressed in terms of a peak noise level for impulsive/impactive sounds, as well as an 8-hour exposure level. In this case, any employee exposed to such a high level of sound, even once in a day, should be counted as being exposed above the exposure limit.

Using the results in the noise survey report in this way, you should be able to construct a picture of those employees likely to be exposed to noise above the exposure limit. You could use this procedure for

identifying priorities for noise control and personal hearing protection and to establish which employees are to be given audiometric testing.

**DESCRIBE
PLANT
OPERATING
CONDITIONS**

A well-written noise survey report should describe the plant operating conditions at the time of the survey, indicate whether the conditions are typical and, if relevant, note the effects of other conditions.

A well-written noise survey report should include most of this information. If you return to the above example, the noise level results in full should read thus:

<i>Machine/process</i>	<i>Noise level $L_{Aeq,T}$ (dB(A))</i>
Angle grinder (100 mm Hitachi, grinding 2 m length of 25 x 25 mm steel tubing)	104
Power hacksaw (cutting 6 m lengths of 25 x 25 mm steel tubing)	88

Now look at these results critically. Consult others in the workplace. Are these typical of the noisiest operations that would take place? If not, you may need to have measurements carried out on the noisiest typical operation. The factors you need to consider include:

- the size and type of material being worked on (larger hollow workpieces may radiate more noise);
- the rate at which work is being done (for example, blows per minute or motor speed);
- the number of machines operating together;
- presence or absence of extraneous noises (for example, noisy equipment due for repairs or contractor on site);
- the amount of time employees would normally spend in that area.

Look carefully at the situation of employees whose noise exposure was found to be marginal, or just below the exposure limit in the survey report. Could any of the above factors cause their exposure to exceed the exposure limit?

In some cases you can estimate the effect of a change in operating conditions. For example, a doubling in the number of blows from 60 to 120 per minute would normally increase the $L_{Aeq,T}$ by 3 dB(A). However, you will probably need to consult an expert in most instances, as these calculations can be very complex. In general, concentrate on the larger factors and don't get distracted by small differences in operating conditions. Keep in mind that you are trying to estimate the employee's noise exposure on a typical "worst-case" day, not under every possible set of conditions!

**ASSESS RISK
TO
EMPLOYEES**

It may be useful to go further than just estimating the number of employees exposed above the exposure limit. Knowing that the risk of hearing loss exists even below the exposure limit and that it increases as the level increases, you may wish to estimate the likely extent of hearing loss for a given level of noise exposure over a nominated period of years. Appendix D of AS1269-1989 gives a method for this type of assessment.

**IDENTIFY
AREAS OF
HIGHEST
EXPOSURES**

In developing a noise control plan, you will need to know where the noise problems are. You can build up this information by studying the workplace and the noise survey report, (although you may not have to have a noise survey done before developing a noise control plan).

A thorough noise survey report might give a list of some noise control treatments required, especially any straightforward items. If not, you can glean a lot of information from the results by working through the following steps.

Step 1

Look at the noise levels themselves and identify items of plant or areas which are potentially:

- extremely hazardous (greater than 105 dB(A));
- hazardous (90 - 105 dB(A));
- marginally hazardous (80 - 90 dB(A)).

Step 2

Look at the period of time over which each source is likely to operate, or the period of time the employee is likely to be exposed to that noise source. Use the noise level and exposure duration data to calculate partial noise exposures, following the procedure outlined above (see the section “*Identify Exposed Employees*” above).

The higher the PNE, the more significant is the risk associated with the operation. In the example the angle grinder represented the greatest level of risk (PNE = 10.0), followed by the welding operation (PNE = 1.6) and the chipping hammer (PNE = 1.3). Note that although the welding operation was less noisy (93 dB(A)) than the chipping hammer (98 dB(A)) the PNE, and therefore the associated risk, was greater because of the longer operating time. So, if the noise survey report gives you results in terms of Partial Noise Exposures, use these to identify high-risk areas.

Step 3

Look at the number of employees involved in each high risk area or operation. In general the greater the numbers of employees at high risk, the higher the priority in the noise control plan.

Some techniques for looking at these issues in greater detail and for comparing the effectiveness of various noise control options are discussed in *Module 9: Evaluating Options*.

SELECT HEARING PROTECTORS

The noise survey report should contain information on the grading of areas or machines/processes and the appropriate personal hearing protectors required (see *Module 12: Personal Protection*).

A noise survey report may give a list of personal hearing protectors and the noise levels to which wearers would be exposed. While this makes selection easy, remember that the “appropriateness” of any protector will depend on other factors as well, such as weight and clamping force of earmuffs, compatibility with other headgear and comfort. This is dealt with in more detail in *Module 12: Personal Protection*.

Finally, keep in mind that personal hearing protection is no substitute for engineering noise control, since:

- the hazard is still there in the workplace;
- you can't be sure exactly how much the risk has been reduced;
- you are placing all the responsibility on the employee.

**PROVIDE
INFORMATION**

A noise survey report is likely to be in too technical a form to be useful to most managers and employees, although this information forms a crucial part of the noise education programme. Here are a few ideas for presenting the information in a more accessible form:

- erect warning signs (standard warning signs are mandatory where personal hearing protection is required);
- summarise results on charts or wall posters;
- publish results in “in-house” newsletters or circulars;
- use results for in-house training sessions;
- fix noise labels to machines where appropriate.

Copies of the noise survey report should always be available at the workplace for any employee, employee representative, manager or health and safety inspector.

**DEFINE LEGAL
OBLIGATIONS**

Having received a noise survey report you should make yourself aware of any legal obligations relating to the report itself. Apart from carrying out noise control work and providing personal hearing protection, there may be requirements to:

- make copies available at the workplace;
- communicate the results to the health and safety inspector;
- communicate the results to employees;
- repeat the noise survey after a period of 5 years.

In some cases, these requirements may be stated in the report. You can check with your local branch of Occupational Safety and Health for current requirements.

SUMMARY Your noise survey report is a working document, a springboard for achieving change in the workplace. The way it is understood and used will have a significant bearing on the effectiveness of your noise management programme.

A word of warning on the selection of personal hearing protectors. It is tempting to go straight to the highest-performance protector, that is the one that reduces noise the most, “to give employees the best protection”. There is a danger in over-protection since workers may not hear warning sounds, they will remove their protectors when not exposed to the loudest noise and the devices may be uncomfortable due to their weight and clamping force. In general, choose appropriately graded devices, that is, a device that has the same grading as (or one grade higher than) the noise in question.