Australian Capital Territory

Environment Protection (Noise Measurement Manual) Approval 2009 (No 1)

Disallowable instrument DI2009—234

made under the

***Environment Protection Regulation 2005*, s29A (Noise measurement manual)**

---

1 Name of instrument

This instrument is the *Environment Protection (Noise Measurement Manual) Approval (No 1).*

2 Commencement

This instrument commences on the day after notification.

3 Approval

I approve the document entitled the *Noise Measurement Manual* as the manual for the measurement of noise under the Environment Protection Regulation 2005.

Simon Corbell
Minister for the Environment, Climate Change and Water
19 November 2009

NOISE MEASUREMENT MANUAL

Environment Protection Authority | September 2009

Produced by Publishing Services for the:
Department of the Environment, Climate Change, Energy and Water

Enquiries about this publication should be directed to:
www.environment.act.gov.au

Printed on recycled paper

Publication No 09/1198
http://www.act.gov.au
Telephone: Canberra Connect 132 281

CONTENTS

1. INTRODUCTION

This manual is designed for use in monitoring compliance with the *Environment Protection Act 1997* (the Act). It outlines how to measure environmental noise to determine compliance with the Act, the Environment Protection Regulation 2005 (the Regulation) and legislative instruments issued under the Act.

This manual is designed for use by 'authorised officers' appointed under the Act, other people requiring information about measuring noise for compliance with statutory requirements, and environmental authorisation holders under the Act.

This manual cannot provide information which covers all circumstances that may be encountered when taking a noise measurement. Where this manual does not provide adequate directions, refer to the applicable Australian Standard.

Noise measurements must be taken in accordance with the procedures described in this manual. There may be situations where deviations may be required from these procedures due to situations beyond the control of the 'authorised officer' or investigator. In these situations details of any deviations and the circumstances which led to the deviations must be recorded.

2. TYPES OF NOISE ASSESSMENTS

Noise measurements are taken to assess compliance with the Act and/or the Regulation. These measurements may be in response to a complaint or in response to a condition of an environmental authorisation issued under the Act.

Noise measurements taken in response to a complaint are generally reactive. In these cases 'authorised officers' must be aware of the Regulation in relation to compliance points at the time of the measurement and the procedures outlined in this manual.

Noise measurements taken in response to a condition of an environmental authorisation are generally planned. The environmental authorisation generally specifies the compliance point (where measurements are to be taken), conditions may specify that noise emissions are permitted only at certain times of the day and permitted noise levels are also usually specified for certain periods of the day. 'Authorised officers' or acoustic consultants must be aware of the conditions of the environmental authorisation, particularly the compliance point and the procedures outlined in this manual.

3. EQUIPMENT

A portable sound level meter (SLM) conforming to the requirements of AS IEC 61672.1 Electroacoustics – Sound level meters Part 1: Specifications must be used.

The SLM should be set to 'A' frequency weighted and 'F' time weighted.

A comprehensive recalibration of the complete measuring system including the SLM and microphone must be carried out by a NATA certified calibration laboratory or equivalent accredited for performing the calibration at least once every two years.

A sound level calibrator which is compatible with the SLM is required for field calibration of the SLM. The calibrator should conform to AS IEC 60942. In addition the calibrator should be recalibrated annually in a NATA certified calibration laboratory or equivalent accredited for performing the calibration.

Octave and one-third octave filters should conform to the requirements of AS/NZS 4476 Acoustics – Octave-band and fractional octave band filters.

4. MEASURING NOISE

4.1 Instrument checks

The SLM should be in proper operating order prior to taking a noise measurement. The following checks may be included to assess operating order:

- Placing any instruments using storage batteries on charge;
- Checking the battery condition of the SLM and the calibrator;
- Ensuring the instruments are within the calibration period;
- Inspecting the instrument for physical damage;
- Switching the equipment on and running an acoustical check using the calibrator;
- Ensuring the date and time on the SLM is correct;
- Storing the SLM with no loose equipment in its carrying case if one is available and out of sight when in a vehicle; and
- Protecting the SLM from extreme heat and moisture/condensation.

4.2 Taking noise measurements

4.2.1 Measurement position

The microphone should be positioned at least 1.2 metres above the ground or floor surface, orientated towards the noise source and, where feasible, 3 metres from any large plane surface.

If the SLM is mounted on a tripod and the microphone is not remote, care must be taken to ensure noise from the officer or the operation of the instrument controls does not influence the results.

The noise measurement should be taken at the compliance point as defined in the Environment Protection Regulation 2005 unless there is sufficient reason for taking the measurement elsewhere. Any deviation from the procedures outlined above must be recorded along with the justification/ explanation for the deviation.

Note: *Further information regarding the compliance point can be found in the Noise Environment Protection Policy.*

4.2.2 Dominant noise source

The noise alleged to cause environmental harm must be the dominant noise source at the time of the measurement and must be the noise that produces the sound pressure levels measured by the SLM. The dominant noise source must be identified and noted by the 'authorised officer'/person at the time the noise measurement is taken.

4.2.3 Recorded observations

Note: *Noise measurements should not be taken if the wind speed is greater than 5m/s or if it is raining.*

As the results of field measurements may be used in court actions, authorised officers/ persons must carry out all measurement procedures in a precise, consistent and reliable manner. The original records made during measurements could be required in court. Therefore the information must be recorded in a clear and unambiguous manner. The following observations shall be recorded by the authorised officer/person for each measurement taken, in an official notebook:

- The address /location of the noise measurement;
- The position of the SLM and distances from reflective surfaces;
- Weather conditions including measurements of wind speed and temperature and observations of wind direction and cloud cover (noted in oktas, see Table 3);
- The time the measurement commenced;
- The dominant noise source and characteristics of the noise source (i.e. impulses, tones, fluctuations, intermittency), refer to Section 6 for further information;
- The details and times of extraneous noises which may affect the measurement of the target noise source;
- The time period of the measurement;
- The L_{A10} and L_{A90} of the measurement (or the descriptors outlined in the environmental authorisation); and
- Details of any deviations from the procedures and the circumstances which led to the deviations.

4.2.4 Instrument use

Note: *Reference should be made to the appropriate instruction manual for the instrument used.*

Note: *If any of the equipment required to take noise measurements is not in good order and condition and cannot be rectified with confidence, it is usually better not to collect data. Faulty equipment should be returned to the office for assessment and to the supplier or manufacturer for repair.*

- The calibration shall be checked in the field prior to starting the measurement and adjusted if necessary.
- Ensure the windshield is fitted.
- Start the measurement and note the time.
- Observe and document the noise sources and their levels throughout the measurement if possible.
- Pause the SLM for extraneous noises, or if unable to pause the meter note the time of the extraneous noise.
- The noise measurement should be an accurate representation of the noise source. A minimum of 5 minutes and a maximum of 15 minutes should be used to obtain an accurate representation of the noise source, unless otherwise specified in an environmental authorisation. ***Note****: For a constant noise*

source such as an air-conditioning unit a 5 minute measurement would be sufficient, however for a time varying sound source a measurement of 10 minutes would be more appropriate.

- The data should be saved on the SLM, where the SLM has this capability.
- Recheck the calibration of the SLM after the measurement.
- Record observations listed in section 4.2.2 above.

5. REPORTING RESULTS

The following information should be reported either within the noise report produced or within the Environment Protection Authority database:

- The address/location of the measurement;
- The name of the person who took the measurement;
- The date and time of the measurement;
- The name, manufacturer, type, serial number and date of most recent laboratory calibration of the equipment used to take the noise measurement (including the SLM and calibrator);
- A description of the SLM position;
- Weather conditions at the time of the measurement including temperature, wind speed and direction and cloud cover;
- Type of noise being measured and the characteristics of the noise;
- Noise levels measured, particularly LA_{10} and LA_{90};
- Frequency weighting used for each measurement;
- Time-weighting characteristic for each measurement;
- Time and nature of any extraneous noise within the measurement period;
- Duration of the measurement period;
- Any tonality or impulsiveness adjustments; and
- Any other data considered appropriate.

6. NOISE ADJUSTMENTS*

Where a noise source contains certain characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration. This section outlines the correction factors which may be applied to the measured noise levels before comparison with the noise standards to account for the additional annoyance caused by these modifying factors. The correction factors below were determined following a review of the Australian and overseas practices and the relevant literature.

The modifying factor corrections should be applied having regard to:

- Noise from all sources, individually and in combination, that contributes to the total noise at a site; and
- The nature of the noise sources and its characteristics.

*The above information is reproduced with minor modifications from the NSW Noise Guide for Local Government, NSW Department of Environment, Climate Change and Water.

Tables 1 and 2 set out the corrections to be applied. The corrections specified for tonal, impulsive, intermittent and low frequency noise are to be added to the measured noise levels at the receiver before comparison with the noise standards.

Table 1: Modifying factor corrections

Factor[1]	*Assessment/ measurement*	*When to apply*	*Correction*[2]	*Comments*
Tonal noise	One third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: 5dB or more if the centre frequency of the band containing the tone is above 400Hz. 8dB or more if the centre frequency of the band containing the tone is 160 to 400Hz inclusive. 15dB or more if the centre frequency of the band containing the tone is below 160Hz.	5dB[3]	Narrow-band frequency analysis may be required to precisely detect occurrence.
Low-frequency noise	Measurement of C-weighted and A-weighted level	Measure to assess C- and A-weighted levels over same time period. Correction to be applied if the difference between the two levels is 15dB or more.	5dB[3]	C-weighting is designed to be more responsive to low-frequency noise.
Impulsive noise	A-weighted fast response and impulse response	If a difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2dB.	Apply difference in measured levels as the correction, up to a maximum of 5dB.	Characterised by a short rise time of 35 milliseconds and decay time of 1.5 seconds.
Intermittent noise	Subjectively assessed	Level varies by more than 5dB.	5dB	Adjustment to be applied for one event in night time only.
Duration	Single-event noise duration may range from 1.5min to 2.5hr	One event in any 24-hour period.	0 to -20dB	The acceptable noise level may be increased by an adjustment depending on the duration of noise (see Table 2)

Table 2: Adjustment for duration

Duration of Noise (one event in any 24-hour period)	*Increase in acceptable noise level at the receptor, dB(A)*	
	Night time (10pm – 7am)	*Daytime and evening (7am – 10pm)*
1 to 2.5 hours	Nil	2
15 min to 1 hour	Nil	5
6 min to 15 min	2	7
1.5 min to 6 min	5	15
Less than 1.5 min	10	20

Notes

1. Definitions to support modifying factor corrections:
   Tonal noise – containing a prominent frequency and characterised by a definite pitch.
   Low-frequency noise – containing major components within the low-frequency range (20 – 250 Hz) of the frequency spectrum.
   Impulsive noise – having a high peak of short duration or a sequence of such peaks.
   Intermittent noise – the level suddenly drops to that of the background noise several times during the assessment period, with a noticeable change in noise level of at least 5dB.
   Adjustment for duration – applied where a single-event noise is continuous for a period of less than two and half hours in any 24 hour period.
   The acceptable noise level may be increased by the adjustment shown in Table 2. This adjustment is designed to account of unusual and one-off events, and does not apply to regular, high noise levels that occur more frequently than once a day.
2. Corrections to be added to the measured levels.
3. Where a source emits noise which has both tonal and low-frequency components, only one 5dB correction should be applied.
4. Where two or more modifying factors are present, the maximum correction is limited to 10dB.

7. DEFINITIONS

Authorised officers – means an officer authorised under section 14(3) of the *Environment Protection Act 1997* to carry out duties under the Act.

Table 3: Definition of oktas

Oktas	*Definition*	*Category*
0	Sky clear	Fine
1	1/8 of sky covered	Fine
2	2/8 of sky covered	Fine
3	3/8 of sky covered	Partly Cloudy
4	4/8 of sky covered	Partly Cloudy
5	5/8 of sky covered	Partly Cloudy
6	6/8 of sky covered	Cloudy
7	7/8 of sky covered or more but not 8/8	Cloudy
8	8/8 of sky completely covered, no brea ks	Overcast

8. REFERENCES

- **Australian Standards**
  - AS IEC 61672.1 Electroacoustics – Sound level meters Part 1: Specifications
  - AS IEC 60942 Electroacoustics – Sound calibrators
  - AS/NZS 4476 Acoustics – Octave-band and fractional-octave-band-filters
  - AS 1055 Acoustics – Description and measurement of environmental noise
- *Environment Protection Act 1997*
- *Environment Protection Regulation 2005*