

*Noise Labeling and Emission
Limits of Outdoor Sources*



Department of Environment
Ministry of Natural Resources and Environment
Malaysia



FOREWORD

The Department of Environment hereby published 3 sets of documents to provide guidance on acceptable noise limits for various types of land use and human activities. *The Planning Guidelines for Environmental Noise Limits and Control* provide noise acceptance criteria for quantitative assessment of noise to define disturbance or otherwise. *The Guidelines for Noise Labeling and Emission Limits of Outdoor Sources* prescribes comprehensive methodology to measure and report noise emission from outdoor sources. *The Planning Guidelines for Vibration Limits and Control* gives vibration acceptance criteria for quantitative assessment of vibration.

It is hoped that these document could serve as useful guide to planners and decision makers at the state and local level as well as other organization, bodies and agencies involved or having responsibilities in the design and/or approval of town planing, infrastructure development, etc. so as to reduce the potential impact of noise affecting public health or causing annoyance or disturbance. Continuing efforts to improve the content and structures of these guidelines based upon feedback from users will be made from time to time.

In the publication of these documents, I would like with sincere appreciation to acknowledge the valuable expert contribution of the University of Technology Malaysia, in particular Prof. Dr. Mohd Salman Leong Bin Abdullah, the relevant agencies and all individuals in providing the necessary and relevant inputs, comments and recommendations towards the successful completion of the documents.

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THE GUIDELINES FOR NOISE LABELING AND EMISSION LIMITS OF OUTDOOR SOURCES

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1.0 Scope

- 1.1 This document presents guidance and recommendations for
- (a) specifying noise emission levels and noise labeling requirements;
 - (b) procedures for measurement and labeling of noise emission of outdoor noise sources; and
 - (c) noise parameters for the description of noise emission of outdoor noise sources.
- 1.2 For the purpose of these Guidelines, definitions used are consistent with those given in ISO 3740:1980, ISO 3746: 1979, ISO 3744: 1994, ISO 7574-3: 1985, and the European Community Council Directives on noise labeling. A glossary of definitions is also included in this document.
- 1.3 These Guidelines present a comprehensive and unambiguous manner upon which noise emission from outdoor noise sources could be measured and reported.

2.0 Purpose

- 2.1 The purposes of these guidelines are:
- (a) to present a uniform method in the measurement and labeling of outdoor noise sources; and
 - (b) to prescribe recommended maximum permissible sound emission levels for a variety of outdoor noise sources for the protection of the public from excessive noise.

3.0 Legislative Background

- 3.1 Section 23 under the Environmental Quality Act 1974 stipulates that: *“No person shall, unless licensed, emit or cause or permit to be emitted any noise greater in volume, intensity or quality in contravention of the acceptable conditions specified under Section 21.”*
- 3.2 The Environmental Quality (Motor Vehicle Noise) Regulation 1987 of the Environmental Quality Act 1974 stipulates permissible noise emission from motor vehicles, and procedures for the measurement of such noise emission.

- 3.3 The Department of Environment in these Guidelines present recommendations upon which acceptable noise emission limits and noise labeling could be specified for outdoor noise sources. These noise sources are for construction and industrial equipment commonly used outdoors. Sound emission from outdoor sound systems is also included. Noise emission from motor vehicles are however not included here as this is enforced under the Motor Vehicle Noise Regulation 1987.
- 3.4 Prior to the guidelines as presented here, acceptable noise limits at the property boundary are recommended for generator sets in the “Guidelines an Application for Permission to Install Generator Sets”. These Guidelines herein, and the Planning Guidelines For Environmental Noise Limits and Control supercede noise limits set in the above document.

4.0 Use of Noise Labeling Information

4.1 Noise labeling information is used to:

- (i) caution project proponents and/or users and purchasers about the noise emission level of equipment and outdoor work activities, and help them to compare or select quieter machines;
- (ii) enable project proponents and users of machines or originator of activities to plan noise control strategies including plant layout, to protect the general public and workers against exposure to excessive noise;
- (iii) give advance notice to project proponent and users of machine that noise level in the environment should be monitored when new machines or equipment are introduced; and
- (iv) warn machines operators that they may be exposed to excessive noise, and hence should wear hearing protectors.

4.2 The intention of defining an acceptable noise emission limit is to:

- (i) control excessive noise generation at source for the protection of the public from excessive noise pollution;
 - (ii) encourage the use of quieter machines and/or implement noise reduction measures on outdoor noise source.
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5.0 Noise Emission Limits

- 5.1 Noise emission limits may be set based on either of the following, depending on the type of noise source:
- (a) an absolute limit based on the sound power levels of the machine or equipment;
 - (b) an absolute limit based on the sound pressure levels of the activity or work process measured at a receptor location.
- 5.2 The recommended maximum permissible sound emission levels for various noise sources are given in Annex A.
- 5.3 The recommended maximum sound power level of airborne noise for power generators, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 1.
- 5.4 The recommended maximum sound power level of airborne noise for excavators, dozers and loaders, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 2.
- 5.5 The recommended maximum sound power level of airborne noise for powered hand held concrete breakers and picks, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 3.
- 5.6 The recommended maximum sound power level of airborne noise for compressors, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 4.
- 5.7 The recommended maximum sound power level of airborne noise for tower cranes, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 5.
- 5.8 The recommended maximum sound power level of airborne noise for welding generators, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 6.
- 5.9 The recommended maximum sound power level of airborne noise for cooling towers, as measured in accordance to procedures set out in these Guidelines should not exceed levels as prescribed in Schedule 7.
- 5.10 The recommended maximum sound pressure level of airborne noise for piling operations as measured in accordance to procedures set out in these Guidelines should not exceed environmental noise levels as prescribed in Schedule 8.

- 5.11 The maximum permissible sound pressure levels for sound reinforcement systems operated outdoors, typically for outdoor concerts, cultural or musical performances, stage shows and theme parks as measured under the conditions set out in these Guidelines should not exceed levels as prescribed in [Schedule 9](#) at the stipulated measurement locations.
- 5.12 Sound power levels of equipment, not stipulated herein in these Guidelines under [Schedule 1 to 8](#) used outdoors in residential or noise sensitive areas should not result in sound pressure levels at the real property boundary exceeding the recommended maximum permissible levels given in the Planning Guidelines for Environmental Noise Limits and Control.
- 5.13 This in particular relates to all types of industrial and domestic fans, blowers, air conditioning, and condensing units. Lawn mowers and other household appliances are exempted from these Guidelines.

6.0 Noise Labeling

- 6.1 Machine tested in accordance with the guidelines prescribed herein should bear a clear and permanent mark (label) indicating the sound power level, in dB (A) referenced to 1 pW, guaranteed by the manufacturer, assembler, distributor and supplier of the machine. An example of a suitable and recommended label is given in [Annex B](#).
- 6.2 The Department of Environment strongly encourages person(s) manufacturing, assembling, distributing, selling and hiring construction and industrial equipment, and any other machines used outdoors to conduct sound emission measurements, and to label the sound emission in accordance to these Guidelines.
- 6.3 The Department of Environment under its condition of the EIA Approval may at its sole discretion require project proponents and/or person(s) using construction and industrial equipment, and other machines used outdoors to comply with maximum permissible sound emission levels as recommended in the Guideline.
- 6.4 The Department of Environment may also require that such sound emission measurements be carried out by an independent testing authority at the costs of project proponent or person(s) responsible.
- 6.5 Local authority may require organizers, promoters or owners of concerts, outdoor performances, theme parks and other outdoor activities with sound reinforcement systems, as a condition in its granting of license(s) for such activities, to comply with maximum permissible sound pressure levels as recommended in [Schedule 9](#). The local Authority may further require these organizers, promoters or owners to conduct sound emission measurements at their own costs by an independent testing authority.
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7.0 Measurement Procedures

- 7.1 The determination of sound power levels, as required in the noise labeling, shall in general be undertaken in accordance to recommendations of:
- a) ISO 3740: 1980 Acoustics – Determination of sound power levels of noise sources – Guidelines for the use of basic standards and for the preparation of noise test codes.
 - b) ISO 3744: 1994 Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane.
 - c) ISO 3746: 1995 Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane.
- 7.2 Sound power levels determination in accordance to ISO 3744 (engineering method) is recommended for noise labeling purpose. Sound power levels determined in accordance to ISO 3745 (precision method) is equally acceptable.
- 7.3 The verification of sound power levels at site may be undertaken in accordance to ISO 3746 (survey method).
- 7.4 Further guidance and reference to any other available ISO standards that are specific for selected machines and equipment may be necessary. A list of such current ISO standards (relating to outdoor or industrial noise sources) is listed in [Annex E](#).
- 7.5 Additional supplementary notes on operating conditions and references to European Community Council Directives for specific machines or equipment are given in [Annex C](#).
- 7.6 Sound measurement instrumentations, acoustic qualification tests of the testing environment, and accuracy of test results shall be guided by the relevant ISO Acoustic Standards as listed in Paragraph 25 above.
- 7.7 Sound pressure level measurements for piling operations shall be undertaken in accordance procedures given in [Annex D](#), and supplementary notes attached therein.
- 7.8 Sound pressure level measurements for sound reinforcement systems applicable for outdoor concerts, performance, stage and theme parks shall be undertaken in accordance to procedures given in [Annex D](#), and supplementary notes attached therein.

ANNEX A SCHEDULE OF PERMISSIBLE SOUND EMISSION LEVELS

SCHEDULE 1

MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF POWER GENERATORS

Electric power (kVA)	Sound power level in dB (A)/1 pW
$P \leq 2$ kVA	102
$2 \text{ kVA} < P \leq 8$ kVA	100
$8 \text{ kVA} < P \leq 240$ kVA	100
$P > 240$ kVA	100

SCHEDULE 2

MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF EXCAVATORS, DOZERS AND LOADERS

Net installed power in kW	Sound-power level in dB (A)/1pW
≤ 70	106
$> 70 \leq 160$	108
$> 160 \leq 350$	118
> 350	118
- hydraulic and rope-operated excavators	112
- other earth-moving machines	113

SCHEDULE 3**MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF
POWERED HAND HELD CONCRETE BREAKERS AND PICKS**

Mass of appliance (m) in kg	Sound-power level in dB (A)/1pW
m < 20 kg	108
20 kg ≤ m ≤ 35 kg	111
m > 35 kg and appliance with an internal-combustion engine incorporated	114

SCHEDULE 4**MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF COMPRESSORS**

Standardised nominal air flow Q in m³/min	Sound-power level in dB (A)/1pW
Q ≤ 5 kg	100
5 < Q ≤ 10	100
10 < Q ≤ 30	102
Q > 30	104

SCHEDULE 5**MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF TOWER CRANES**

	Sound-power level in dB (A)/1pW
Lifting mechanism	100
Energy generator	See Schedule 1 (power generators according to the power generated)
Assembly comprising lifting mechanism and energy generator	Highest values of the two components

SCHEDULE 6**MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF WELDING GENERATORS**

Nominal maximum welding current in amps (A)	Sound-power level in dB (A)/1pW
Not greater than 200 A	101
Greater than 200 A	100

SCHEDULE 7**MAXIMUM PERMISSIBLE SOUND POWER LEVELS OF COOLING TOWERS**

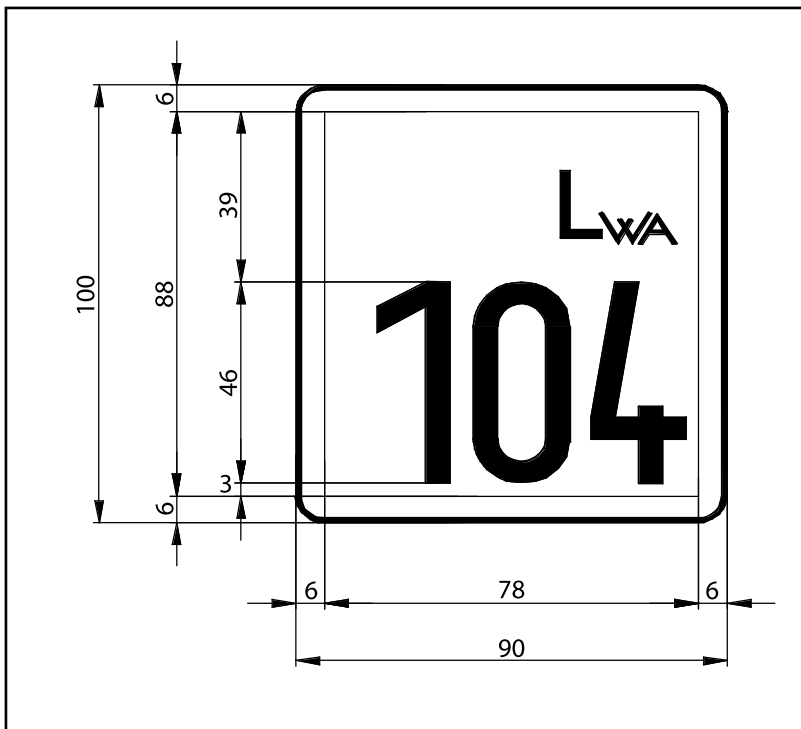
Fan Power in kW	Sound-power level in dB(A)/1pW
< 60 kW	105
> 60 kW	108

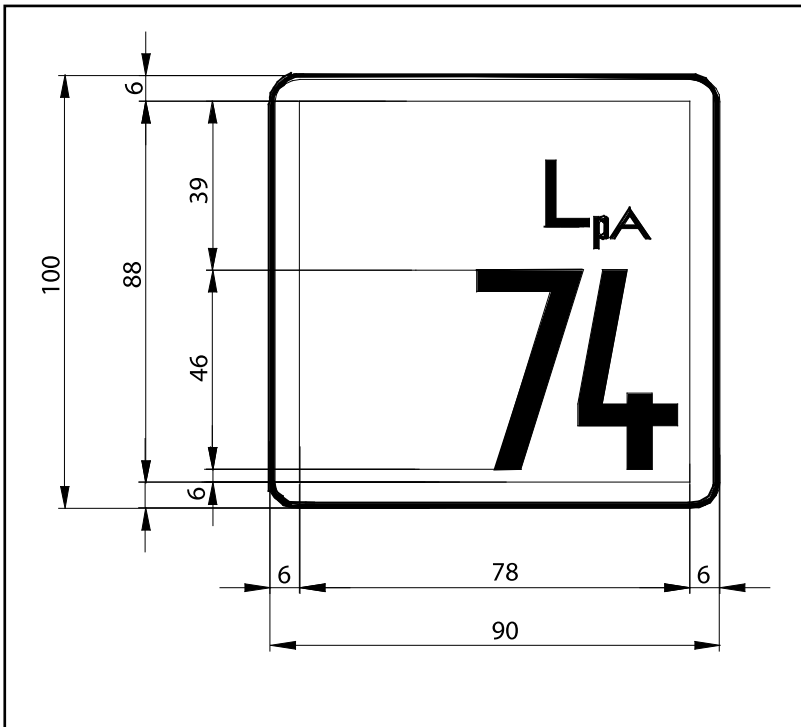
SCHEDULE 8**MAXIMUM PERMISSIBLE SOUND PRESSURE LEVELS FROM PILING OPERATIONS**

At Real Property Boundary. For Receiving Land Use Category	Noise Parameter	Sound Pressure Level (dBA)
Residential	L ₉₀	60
	L ₁₀	75
	L _{max}	90
Commercial	L ₉₀	65
	L ₁₀	75
Industrial	L ₉₀	70
	L ₁₀	80

SCHEDULE 9**MAXIMUM PERMISSIBLE SOUND PRESSURE LEVELS FOR SOUND REINFORCEMENT SYSTEMS (APPLICABLE FOR OUTDOOR CONCERTS, PERFORMANCE, STAGE AND THEME PARKS)**

Location	Noise Parameter, dB (A)			
	L_{eq}	L₁₀	L₉₀	L_{max}
At Stage, Pavilion (At Source)	95	98	90	105
At Audience	85	88	80	95

ANNEX B**NOISE LABEL STATING THE SOUND POWER AND SOUND PRESSURE LEVEL****(a) Sound Power Level, dB (A)**



(b) Sound Pressure Level, dB (A) at Machine Operator's position

ANNEX C

SUPPLEMENTARY NOTES ON MEASUREMENT CONDITIONS FOR SPECIFIC MACHINES

The acoustic parameter describing airborne sound emission of machines in these Guidelines is basically based on sound power levels. The determination of sound power levels shall generally be based on procedures laid out in the ISO standards, and in particular ISO 3740, ISO 3744 and ISO 3746. Supplementary procedures and/or provisions unique to specific machines may be appropriate to ensure uniformity of operating conditions upon which the sound power levels are rated. These procedures and/or provisions are described herein.

1.0 Power generators

- (a) The power generator shall operate at a steady speed, with a current flow through a non-inductive resistance equal to three-quarters of the unit power load in kW defined on the basis of the nominal power in kVA, taking into account the power factor ($\cos \phi$).

Skid-mounted power generators shall be placed on supports 0.40m high, unless otherwise required by the manufacturer's conditions of installations.

- (b) Additional guidance is given in the European Community Council Directive 84/536/EEC.

2.0 Excavators, dozers, loaders

- (a) Sound power determination of earth moving equipment shall be guided by ISO 6393, ISO 6394 and ISO 6395, and the European Community Council Directive 86/662/EEC.
- (b) In the event that airborne noise emissions under conventional working conditions are required, the dynamic test method of measurements is preferred (ISO 6395, ISO 6396, and Annex II of Directive 86/662/EEC).

3.0 Powered hand held concrete breakers and picks

- (a) The concrete breakers and picks shall be fitted out for normal use coupled during the test to a tool embedded in a cube-shaped concrete block placed in a concrete pit sunk into the ground. This concrete test block characteristics, supports of the concrete breakers and picks shall be in accordance to Annex 1 of Directive 84/537/EEC.

The compressor supplying compressed air to the concrete breakers and picks shall be acoustically shielded; and the noise emission of the compressor separately rated as prescribed in this regulation (see Item 4(a) of this Section below).

- (b) Additional guidance is given in European Community Council Directive 84/537/EEC.

4.0 Compressors

- (a) During testing, no tools shall be coupled to the compressor. At each measuring point, the noise level of release and escape of air from the external lines coupled to the air outlet valves of compressors shall be more than 10 dB lower than the noise level of the compressor.
- (b) Air volume flow rate of the compressor shall be measured by means of circular air venturi nozzles under critical flow conditions as prescribed in Annex 1 of Directive 84/533/EC. Alternative air volume flow rate measurement methods with a $\pm 2.5\%$ accuracy are also acceptable.
- (c) Additional guidance is given in European Community Council Directive 84/533/EEC.

5.0 Tower Cranes

- (a) Measurements shall be carried out at ground level. The measuring surface to be used for the ground-level test shall be a hemisphere. The centre of the hemisphere shall be the vertical projection on the flat reflecting surface of the geometric centre of the frame of the lifting mechanism of the energy generator or of the two combined.
- (b) Additional guidance is given in European Community Council Directive 84/534/EEC.

6.0 Welding generators

- (a) The welding generator shall operate in accordance to manufacturer's recommendations and recommendation laid down in ISO/R700-1968 at its nominal speed producing the nominal welding current through a resistance.
- (b) Additional guidance is given in European Community Council Directive 84/535/EEC.

7.0 Cooling towers

- (a) The measurement surface for sound power determination of cooling towers shall include measurement points for air intake and discharge.
 - (b) The cooling tower shall operate in accordance to manufacturer's recommendations at rated capacity of the cooling tower under load.
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ANNEX D

METHOD TO DETERMINE AIRBORNE SOUND EMISSION OF OUTDOOR NOISE SOURCES (PILING OPERATIONS AND SOUND REINFORCEMENT SYSTEMS)

1.0 Purpose

The purpose of this procedure is to determine the sound emitted from piling operations and from all categories of sound reinforcement systems used outdoors.

2.0 Scope

- (a) This method is applicable to any type of piling operations in construction sites, etc., and from sound electronically amplified or reproduced from musical instruments, human voice and other sound reproduction materials.
- (b) Due to the diversely different nature of the above noise sources, supplementary notes are given for measuring conditions specific for the noise source.

3.0 Measuring instruments

3.1 Measuring apparatus

- (a) The measurement shall be made with a precision sound level meter which comply with the requirements of the IEC Publication 651, first edition 1979 or thereafter, for the type of meters in Class 1.
- (b) If, for any measurement, instruments other than a precision sound level meter or combinations of instruments, such as integrators are used, all the specifications of such instruments shall comply with the relevant requirements of IEC Publication 651, first edition 1979. Use of a microphone with cable shall comply with IEC Publication 651, first edition 1979, and calibrated for free field measurement.

3.2 Inspection of the measuring apparatus

- (a) Before the tests, the acoustic properties of the entire apparatus (measuring instruments including microphone and cable) shall be checked by means of calibrated sound source with an accuracy of at least 0.5 dB (e.g. a piston phone). The apparatus shall be checked again immediately after each series measurements.

3.3 Weighting network

- (a) Use shall be made of an A-weighting network meeting the requirements of IEC publication 179, 1973, second edition, or thereafter.
- (b) The above on-the-spot checks shall be supplemented by more thorough calibrations to be carried out at least once a year in a specially equipped laboratory or standards institution (e.g. SIRIM).

3.4 Statistical analysis

The sound level meter or combinations of instruments, such as real time analysers, shall be fitted with statistical analysis functions to derive statistical centile sound pressure levels (ten percentile level L_{10} , ninety percentile level L_{90}), the maximum instantaneous sound pressure level L_{max} , and equivalent sound pressure level L_{Aeq} over the prescribed measuring time period.

4.0 Measuring condition for sound emissions from piling operations

4.1 Piling operations

- (a) Measurements shall be undertaken for the duration of the piling operation of a single pile length under worst case conditions of ground penetration rated at the operational impact energy per blow fitted with the operational dolly.
- (b) Measurements shall be repeated to cover different soil conditions and/or source receiver distances.

4.2 Measurement site

Measurements for operations from piling machines shall be carried out at ground level at the real property boundary of the receiver.

5.0 Measuring conditions for sound emission from sound reinforcement systems

5.1 Operation of all loudspeakers and sound amplification equipment

- (a) With an intent of evaluating actual operational conditions, all sound amplification equipment shall be operational, and all loudspeakers activated (i.e. patched into the sound reinforcement system).
- (b) The entire sound reinforcement system(s) which forms the integral sound sources to be tested shall be operated with the actual operation media of sound reproduction or reinforcement (i.e. live band music, human voice, pre-recorded media, etc. as the case may be).
- (c) All electronic gain control settings (sound intensity, volume control etc.) of the power amplifiers, mixing consoles, line outputs, etc. shall be at the full operational levels.
- (d) The sound sources (loudspeakers clusters, stage frontal loudspeakers, monitor speakers, etc.) shall be installed in its normal operational location and orientation on site.
- (e) The results of a measurement shall be valid only for the combination tested.

5.2 Measurement locations

Measurements shall be undertaken at the stage, pavilion and source location, including main loudspeaker clusters (at distance not less 3 metre); and at the audience or public areas (as the case may be).

6.0 Measurement

6.1 Measurement of the acoustic properties of the measuring site

The environment conditions at the measuring site shall be checked before measurements are carried out. The following factors shall be checked:

- (a) extraneous and other activity noise unrelated to the noise source of interest;
- (b) wind interference;
- (c) operating conditions such as temperature, humidity, barometric pressure.

Corrections for extraneous noise shall be undertaken if and only if this noise is deemed not representative of the site (for example construction activities).

6.2 Measurement of sound pressure levels (L_{Aeq} , L_{max} , L_{10} , L_{90})

- (a) Continuous noise monitoring of the sound emissions of the noise source over the complete duration of the sound source generation shall be undertaken. For practical convenience, monitoring in regular time period segments (e.g. hourly segments repeated over different time period) is also acceptable.
- (b) Statistical analysis of the instantaneous sound pressure levels over the monitoring period shall be undertaken to obtain the statistical centile levels of L_{10} (ten percentile level) and L_{90} (ninety percentile level). The maximum instantaneous level L_{max} over the monitoring period shall also be noted.
- (c) The equivalent A weighted sound pressure level L_{Aeq} over the monitoring time period shall also be measured.

7.0 Data to be reported

The following information shall be compiled and recorded in a report concerning all measurements made with respect to these Guidelines.

7.1 Sound sources under test

- (a) Piling operations
 - Description of piling method or system, and/or type of piles;
 - Pile depth(s) for which noise levels were measured; and
 - Soil condition.
- (b) Sound Reinforcement System
 - Description of the sound reinforcement system under test, including rated power output of sound amplification devices, and loudspeaker ratings;
 - Operating conditions of the sound reinforcement systems (gain control settings, line inputs - voice, music, live band, etc.);
 - Location and elevation of sound sources (loudspeakers, including remote distributed loudspeakers) and its proximity to adjoining properties.

7.2 Acoustic environment

- (a) Description of the measuring site; diagram showing the location of sound sources and any reflecting or screening surfaces on the measuring site;
- (b) Meteorological conditions.

7.3 Instrumentation

- (a) Equipment used for the measurements, including the name of the equipment, type, serial number and name of manufacturer;
- (b) Method used to calibrate the measuring equipment in accordance with 3.2.

7.4 Acoustic data

- (a) Equivalent "A" weighted sound pressure level (L_{Aeq}) for the time period of measurement;
- (b) A-weighted statistical centile levels L_{10} and L_{90} the time period of measurement;
- (c) Maximum instantaneous sound pressure level (L_{max}) for the time period of measurement;
- (d) Measurement time duration.

ANNEX E

STATUTORY INSTRUMENTS, STANDARDS AND OTHER GUIDANCE

1.0 Statutory instruments

Environmental Quality Act 1974.

2.0 ISO Standards

- (a) ISO 1680–1:1986 Acoustics – Test code for the measurement of airborne noise emitted by rotating electrical machinery – Part 1: Engineering method for free-field conditions over a reflecting plane
- (b) ISO 1680–2:1986 Acoustics – Test code for the measurement of airborne noise emitted by rotating electrical machinery – Part 2: Survey method
- (c) ISO 2151:1972 Measurement of airborne noise emitted by compressor/prime mover-units intended for outdoor use (To be replaced by future ISO 3989 of TC 43)
- (d) ISO 4412–1:1991 Hydraulic fluid power – Test code for determination of airborne noise levels – Part 1: Pumps
- (e) ISO 4412-2: 1991 Hydraulic fluid power – Test code for determination of airborne noise levels – Part 2: Motors
- (f) ISO 4412-3: 1991 Hydraulic fluid power – Test code for determination of airborne noise levels – Part 3: Pumps – Method using a parallelepiped microphone array
- (g) ISO 4872:1978 Acoustics – Measurement of airborne noise emitted by construction equipment intended for outdoor use – Method for determining compliance with noise limits
- (h) ISO 5131:1983 Acoustics – Tractors and machinery for agriculture and forestry – Measurement of noise at the operator’s position – Survey method
- (i) ISO/DIS 5131 Acoustics – Tractors and machinery for agriculture and forestry – Measurement of noise at the operator’s position – Survey method (Revision of ISO 5131:1982)

- (j) ISO 6191:1988 Acoustics – Measurement of sound pressure levels of gas turbine installations for evaluating environmental noise – Survey method
- (k) ISO 6393:1985 Acoustics – Measurement of airborne noise emitted by earth-moving machinery – Method for determining compliance with limits for exterior noise – Stationary test condition
- (l) ISO 6394:1985 Acoustics – Measurement of airborne noise emitted by earth-moving machinery – Operator’s position – Stationary test condition
- (m) ISO/DIS 6394 Acoustics – Measurement at the operator’s position of noise emitted by earth-moving machinery – Stationary test conditions
- (n) ISO 6395:1988 Acoustics – Measurement of exterior noise emitted by earth-moving machinery – Dynamic test conditions
- (o) ISO 6396:1992 Acoustics – Measurement at the operator’s position of noise emitted by earth-moving machinery – Dynamic test conditions
- (p) ISO 6798:1995 Reciprocating internal combustion engines – Measurement of emitted airborne noise – Engineering method and survey method
- (q) ISO 7182:1984 Acoustics – Measurement at the operator’s position of airborne noise emitted by chain saws
- (r) ISO 7216:1992 Acoustics – Agricultural and forestry wheeled tractors and self-propelled machines – Measurement of noise emitted when in motion
- (s) ISO 7917:1987 Acoustics – Measurement at the operator’s position of airborne noise emitted by brush saws.
- (t) ISO/DIS 8528 – 10 Reciprocating internal combustion engine driven alternating current generating sets – Part 10: measurement of airborne noise by the enveloping surface method
- (u) ISO 9207:1995 Manually portable chain-saws with internal combustion engine – Determination of sound levels – Engineering method (grade 2)
- (v) ISO/DIS 10302 Acoustics – Method for the measurement of airborne noise emitted by small air-moving devices
- (w) ISO 10494:1993 Gas turbines and gas turbines sets – Measurement of emitted airborne noise – Engineering/survey method

- (x) ISO 10884:1995 Manually portable brush-cutters and grass-trimmers with internal combustion engine – Determination of sound power levels – Engineering method (Grade 2)
- (y) ISO 11094:1991 – Acoustics – Test code for the measurement of airborne noise emitted by power lawn movers, lawn tractors, lawn and garden tractors, professional mowers and lawn and garden tractors with mowing attachments]

3.0 EEC DIRECTIVES

- (a) Council directive 78/1015/EEC of 19 December 1978 on the approximation of the laws of the Member States relating to the determination of the noise emission of construction plant and equipment.
- (b) Council Directive 84/533/EEC of 17 September 1984 on the approximation of the laws of the Member States relating to the permissible sound power level of compressors.
- (c) Council Directive 84/534/EEC of 17 September 1984 on the approximation of the laws of the Member States relating to the permissible sound power level of tower cranes.
- (d) Council Directive 84/535/EEC of 17 September 1984 on the approximation of the laws of the Member States relating to the permissible sound power level of welding generators.
- (e) Council Directive 84/536/EEC of 17 September 1984 on the approximation of the laws of the Members States relating to the permissible sound power level of power generators.
- (f) Council Directive 84/537/EEC of 17 September 1984 on the approximation of the laws of the Member States relating to the permissible sound power level of powered hand-held concrete-breakers and picks.
- (g) Council Directive 84/538/EEC of 17 September 1984 on the approximation of the laws of the Member States relating to the permissible sound power level of lawnmowers.
- (h) Council Directive 86/594/EEC of 1 December 1986 on airborne noise emitted by household appliances.
- (i) Council Directive 86/662/EEC of 22 December 1986 on the limitation of noise emitted by hydraulic excavators, rope-operated excavators, dozers, loaders and excavator-loaders.

GLOSSARY

“airborne noise emission”

means the “A”-weighted sound power level, L_{WA} , or SWL, emitted by the noise source expressed in decibels (dB) with reference to the sound power of one picowatt (1pW), and transmitted by the air.

“background noise”

means any noise recorded at the measuring points which are not generated by the sound source.

“compressor”

means any motor-driven device for circulating and compressing air other than the following two categories of device: fans, i.e. devices producing air circulation at a positive pressure of not more than 1.1 atmospheric pressure; and vacuum pumps, i.e. devices or appliances for extracting air from an enclosed space at a pressure not exceeding atmospheric pressure.

“dozers”

means self-propelled wheeled or crawler machines fitted in front with a blade which serves primarily to displace or spread materials.

“equivalent A-weighted sound level (L_{Aeq})”

means the constant sound level that, in a given situation and time period, conveys the same sound energy as the actual time-varying A-weighted sound.

“excavator”

(hydraulic or rope-operated) means machine combining a self-propelled undercarriage with an upper structure which can swivel through more than 360°. The machine excavates, lifts, carries and dumps material by moving a boom, an arm and bucket (as is the case with a face shovel or a backhoe) or a bucket controlled by the winding gear (as is the case with a drag-line or a clamshell).

“excavator-loader”

means self-propelled wheeled or crawler machine, designed to be fitted with a loading bucket at the front and an excavating arm at the rear as original equipment. The loading bucket loads, raises, transports and dumps material by combining its own movements with those of the machine. The excavating arm excavates raises and dumps material by movements of the boom, arm and bucket.

“extraneous noise”

means the noise resulting from background noise and parasitic noise.

“household appliance”

means any machine, portion of a machine or installation manufactured principally for use in dwellings, including cellars, garages and other outbuildings, in particular household appliances for upkeep, cleaning purposes, preparation and storage of foodstuffs, production and distribution of heat and cold, air conditioning, and other appliances used for non-commercial purposes;

“impulsive sound”

means sound of short duration, usually less than one second, with an abrupt onset and rapid decay. Without prejudice to the foregoing, examples of sources of impulsive sound shall include but not limited to pile drivers, drop hammer or driven impacts and explosions.

“lawnmower”

means all motorised equipment appropriate for the upkeep by cutting, by whatever method, of areas under grass used for recreational, decorative or similar purposes.

“loader”

means self-propelled wheeled or crawler machine fitted in front with a bucket. The machine loads, raises, transports and dumps material by combining its own movements and those of the bucket.

“machine”

means device, equipment or parts of equipment and installation, mechanically or electrically driven or otherwise, as used for any forms of work. This includes construction plant equipment, and all forms of equipment used outdoors.

“measuring surface”

means a hypothetical surface surrounding the sound source and on which sound measurement points are arranged.

“person”

means any individual, association, partnership, firm, society or corporation, and includes any officer, employee, department, agency or instrumentality of a State.

“power generator”

means any device comprising a motor unit driving a rotary generator producing continuous electrical power.

“real property boundary”

means an imaginary line along the ground surface, and its vertical extension, which separates the real property owned by one person from that owned by another person, but not including intra-building real property divisions, as delineated in the land title appearing in the Certificate of Title.

“sound or noise emission”

means sound as emitted or discharged from a sound source(s).

“sound immission”

means sound as propagated onto and received by a receiver from source(s) external to the receiver or real property.

“sound power”

means the acoustic energy emission radiated by a sound source, expressed in unit of Watts (W).

“sound power level”

means 10 times the logarithm to the base 10 of the ratio of the sound power to the reference power of 1 pW. The sound power level is denoted L_W or SWL and is expressed in decibels. The sound power level expressed in dB (A) is denoted as L_{WA} or SWL (A).

“sound pressure”

means the instantaneous difference between the actual pressure and the average or barometric pressure at a given point in space, as produced by sound energy.

“sound pressure level”

means 20 times the logarithm to the base 10 of the ratio of the RMS sound pressure to the reference pressure of 20 micropascals. The sound pressure level is denoted L_p or SPL, and is expressed in decibels.

“sound reinforcement systems”

means any electronic or similar devices which produces, reproduces or amplifies sound.

“sound source”

means the machine, equipment, installation including its sub-components, sound reinforcement systems including loudspeakers, and other sources from which sound originates.

“tower crane”

means a power-driven lifting appliance which when in use, consists of a vertical tower with a jib fitted to the upper part; is equipped with means for raising and lowering suspended loads and for horizontal movement of such loads by variation of load-lifting radius and/or by slewing and/or by traveling of the complete appliance; is designed to be able to be removed when the work for which it was erected has been completed.

“welding generator”

means any rotary device which produces a welding current.
