

Guideline

Noise

Noise and vibration from blasting

This guideline sets out performance criteria to be used when setting operating requirements in conditions of environmental authorities issued under the Environmental Protection Act 1994 (and in other approvals) for activities involving blasting, such as mines, quarries and construction. The guideline can also be used for compliance assessment purposes – it includes: human comfort criteria for air-blast overpressure; ground vibration peak particle velocity criteria; and acceptable times for undertaking blasting.

Introduction

Blasting operations can have unacceptable noise and vibration impacts if not conducted correctly. Excessive levels of structural vibration due to ground vibration from blasting can cause substantial damage to structures. People can detect vibration at much lower levels than those that would cause even superficial damage to the most susceptible structures.

Use of the criteria set out in this guideline will help minimise the annoyance and discomfort that can be caused by blasting for activities such as mining, quarrying, construction and other operations.

All blasting must be carried out in a proper manner by a competent person in accordance with best practice environmental management, in order to minimise the likelihood of adverse effects being caused by airblast overpressure and ground-borne vibration at noise-sensitive places and on people using the surrounding area.

Noise and vibration criteria for blasting

For construction and quarry

Blasting limits Surface mining	Sensitive or commercial place criteria
	9am to 3pm Monday to Friday and 9am to 1pm Saturday
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time
Ground vibration peak particle velocity (vector sum)	5 mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time

Notes 1 Under exceptional circumstance blasting may extend to 5pm

Notes 2 No Blasting on Sunday and Public Holidays

For mining industry

Blasting limits Surface mining	Sensitive or commercial place criteria	
	7am to 6pm	6pm to 7am
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	<insert either no blasting or limits justified by proponent not less stringent than 7am – 6pm>
Ground vibration peak particle velocity (vector sum)	5 mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	<insert either no blasting or limits justified by proponent not less stringent than 7am – 6pm>
Blasting limits Underground mining	Sensitive or commercial blasting noise limits place limits	
	7am to 6pm	6pm to 7am
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	115 dB (Linear) Peak
Ground vibration peak particle velocity (vector sum)	5 mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	2 mm/second peak

Blasting outside of these times should be only conducted where:

- a) blasting during the preferred times is demonstrably impracticable (in such situations blasts should be limited in number and stricter airblast overpressure and ground vibration limits should apply) or
- b) there is no likelihood of persons in a noise-sensitive place being affected by the blasting due to the remoteness of the blast site from that place.

Measurement

Outdoor measurement of airblast overpressure

Measurements of airblast overpressure should be undertaken at a location:

- c) exposed to the direction of blasting; and
- d) at a distance of at least 4m from any noise-affected building or structure, or within the boundary of a noise sensitive place; and
- e) between 1.2m and 1.5m from the ground.

Outdoor measurement of ground vibration

The ground-borne vibration transducer (or array) used in the measurement must be attached to a mass of at least 30kg to ensure good coupling with the ground where the blast site and the measurement site cannot be shown to be on the same underlying strata. The mass must be buried so that its uppermost surface is level with the ground surface.

The ground-borne vibration transducer (or array) must be placed at a distance of not less than the longest dimension of the foundations of a noise-affected building or structure away from such a building or structure and be positioned between that building or structure and the blasting site

Monitoring and recording to assess compliance with airblast overpressure and ground vibration requirements

When conducting monitoring of compliance with airblast overpressure and ground vibration requirements (including when investigating community complaints about noise or vibration impacts) the following information must be collected and recorded:

- 1) maximum instantaneous charge (MIC) in kilograms (kg)
- 2) location of the blast within the quarry (including which bench level)
- 3) airblast overpressure level, dB (linear) peak
- 4) peak particle velocity (mms^{-1})
- 5) location, date and time of recording the MIC
- 6) meteorological conditions (including temperature, relative humidity, temperature gradient, cloud cover, wind speed and direction)
- 7) distance from the blast location to any noise-affected buildings or structures, or the boundary of any noise sensitive place.

Where access to a noise-affected property for monitoring purposes is not feasible, measurements may be undertaken at the appropriate property boundary and the results extrapolated to reflect the impacts of noise and/or vibration at the receptor premises.

Blasting noise must only be measured using noise measurement equipment having a lower limiting frequency of 2Hz (- 3dB response point of the measurement system) and a detector onset time of not greater than 100 microseconds as assessed in accordance with AS –1259.1 clauses 8.5 and 10.4.

Ground vibration instrumentation used for compliance monitoring must be capable of measurement over the range 0.1mms^{-1} to 300mms^{-1} with an accuracy of not less than 5% and have a flat frequency response to within 5% over the frequency range of 4.5Hz to 250Hz.

Weather effects

When a temperature inversion or a heavy, low cloud cover is present, values of airblast overpressure will be higher than normal in surrounding areas. Accordingly, blasting should be avoided if predicted values of airblast overpressure in noise-sensitive places exceed acceptable levels. If avoidance is not practicable, blasting events should be scheduled so as to minimise noise annoyance. An appropriate period, likely to minimise annoyance would generally be between 11am and 1pm on a given day (other than on Sundays or public holidays). Similarly, blasting should be avoided at times when strong winds are blowing from the blasting site towards noise sensitive places.

Quality assurance – airblast overpressure and ground vibration

The measurement and reporting of airblast overpressure and ground vibration levels must be undertaken by a person or organisation possessing both the necessary qualifications and experience appropriate to performing the required measurements and reporting.

Recording Details of the measurement instrumentation, measurement procedure, location, date and time of recording and conditions prevailing during measurements must be recorded for each assessment.

Records must be kept of the results of all airblast overpressure and ground vibration levels and other information required to be recorded in conjunction with such monitoring for a period of at least five years.

Glossary of terms

Airblast overpressure (or airblast level) is the energy transmitted from the blast site within the atmosphere in the form of pressure waves. As these waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations. The pressure wave consists of both audible (noise) and inaudible (concussion) energy. The maximum excess pressure in this wave is known as the peak air overpressure, generally measured in decibels using the linear frequency-weighting.

Bench height is a reference point peculiar to a specific site, used to determine elevations from the baseline (datum).

Blasting is the use of explosives to fracture:

- rock, coal and other minerals for later recovery or
- structural components or other items to facilitate removal from a site or for reuse.

Burden is the distance between blast holes and the nearest exposed face.

dB (Linear) Peak is the maximum reading in decibels (dB) in Linear scale (Z) or unfiltered; obtained using the “P” time – weighting characteristic as specified in AS 1259.1 – 1990 with all frequency weighted networks inoperative.

Face is a wall of rock, usually near vertical, either naturally formed or, as is more often the case, formed by blasting.

Maximum instantaneous charge is the maximum amount of explosive in kg on any one specific delay detonator in any one blast hole.

Noise-sensitive place means any of the following places:

- a) a dwelling
- b) a library or an educational institution, including a school, college or university
- c) childcare centre or kindergarten,
- d) a hospital, surgery or other medical institution
- e) commercial and retail activity
- f) a protected area, or an area identified under a conservation plan as a critical habitat or an area of major interest, under the *Nature Conservation Act 1992*
- g) a marine park under the *Marine Parks Act 2004*
- h) a park or garden that is open to the public (whether or not on payment of an amount) for use other than for sport or organised entertainment.

Peak particle velocity is a measure of ground vibration magnitude and is the maximum instantaneous particle velocity at a point during a given time interval in mms^{-1} . (Peak particle velocity can be taken as the vector sum of the three component particle velocities in mutually perpendicular directions).

Reference material

- The Australian and New Zealand Environment and Conservation Council. 1990. *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.
- *Australian Standards 2187.2-2006 - Appendix J – Ground Vibration and Airblast Overpressure*
- *Noise Measurement Manual 2020, Department of Environment and Science (QLD)*

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