

26 July 2010

STANDARDS NEW ZEALAND **FACTSHEET**

REVISED WIND FARM NOISE STANDARD NZS 6808:2010 – FREQUENTLY ASKED QUESTIONS

THE REVISED STANDARD

What is NZS 6808:2010?

NZS 6808:2010 *Acoustics – Wind farm noise* is a New Zealand Standard that provides methods for the prediction, measurement, and assessment of sound from wind turbines. It recommends limits for the level of sound from wind farms that can be heard from noise sensitive locations such as homes and schools.

NZS 6808:2010 is a revised version of the original 1998 Standard.

What does it do?

NZS 6808:2010 is intended to be used to avoid adverse noise effects on people caused by the operation of wind farms while enabling the sustainable management of natural wind resources. This can be achieved through resource

planning measures to address the management of effects of wind farm sound on noise sensitive activities. This approach is consistent with how sound from other sources is managed, such as from ports and airports.

This Standard incorporates guidelines for best practice assessment of projects. Application of this Standard will enable assessment of potential noise effects on people and communities and identify appropriate mitigation measures and suitable noise limits.

What other acoustics Standards exist?

Several New Zealand Standards deal with the management of environmental noise – some deal with sound in general (NZS 6801 and NZS 6802) – and some deal with particular sources of sound. The latter Standards cover noise sources such as construction (NZS 6803), airports (NZS 6805), heliports (NZS 6807), and ports (NZS 6809).

Why is a specific Standard needed for wind farm noise?

General acoustics Standards for measurement of sound, such as NZS 6801, are designed for measurements in wind speeds below 5 metres per second (m/s), which is relatively calm. However, wind turbines operate in wind speeds typically from 4 m/s to 25 m/s and their sound levels vary with wind speed. High wind speed conditions also create increased environmental sound from vegetation and can affect the microphones used to measure the sound.

For these reasons, a method is needed that enables sound to be measured and assessed in windy conditions. The key aspects of NZS 6808 are the use of the 'L90' parameter for measuring wind farm sound, and the correlation of measured sound levels with wind speeds. The L90 is a measurement of the sound level exceeded for 90 per cent of the time. It is unaffected by high level, short-term sounds caused by the energy in wind gusts, but registers continuous wind turbine sound.

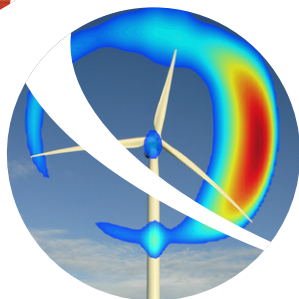
Why was it necessary to revise the 1998 Standard?

Noise from wind turbines can be a contentious issue. To ensure that communities are protected from unreasonable sound from wind farms without unreasonably preventing appropriate wind farm development, it is important to have identified and agreed upon methods for the prediction, measurement, and assessment of sound from wind turbines, as well as noise limits.

The 1998 version of the Standard was written prior to significant wind farm development in New Zealand. The basic methodology of the 1998 Standard is robust, but experience and research in intervening years have highlighted the need for refinements and enhancements.

New Zealand Wind Energy Association (NZWEA), the industry association representing companies involved in New Zealand's wind energy sector, and Energy Efficiency and Conservation Authority (EECA) co-funded Standards New Zealand to undertake an independent revision of the 1998 Standard to incorporate recent research and experience.

The revised Standard provides wind farm developers, local authority decision-makers and communities with robust methods for the prediction, measurement, and assessment of sound from wind farms, and it recommends limits on sound from wind farms to prevent communities from experiencing unreasonable noise.



Does the 2010 version allow higher noise levels than the 1998 version?

No, in fact the new version introduces more stringent requirements for wind farms.

The 2010 version retains the recommended noise limits in the 1998 version, which is that the level of sound from a wind farm should not exceed the background sound level by more than 5 dB, or a level of 40 dB $L_{A90(10 \text{ min})}$, whichever is the greater.

The new version also introduces a provision for a lower, more stringent limit where a local authority has identified the need to provide a higher degree of protection of acoustic amenity in a particular area. This new provision is referred to as the high amenity limit.

The Standard sets out in more detail the circumstances under which these limits should apply.

So how does the 2010 revised version differ from the 1998 Standard, and why?

In addition to the provision for a lower, more stringent, limit in special circumstances, a number of technical changes have been made and additional guidance added to the Standard.

The measure of sound levels has changed from L95 to L90 (that is, the sound level equalled or exceeded for 90% of the time) to bring the Standard into line with the L90 descriptor used in other updated New Zealand Standards. There is no significant difference between the L90 and L95 values of typical environmental sound, so this change does not affect the recommended noise limits in the Standard.

The new Standard provides better protection for communities by explicitly addressing issues such as: cumulative effects from multiple wind farms or wind farms developed in stages; forewarning prospective residents of an area already affected or permitted to be affected by wind farm sound (reverse sensitivity); and wind farm specific audible characteristics (amplitude modulation).

The prediction and measurement methods have both been tightened up. The prediction method now requires more refined calculations, with consideration of a wider range of factors affecting sound propagation, including different frequency components. The measurement method is now more robust with numerous refinements, including wind speed reference at the turbine hub-height to avoid errors from wind shear estimation. An option of using 'on/off' measurements has been added.

Why doesn't the Standard have a single fixed noise limit?

In many instances when the wind is blowing the background sound may be over 40 dB, which is the value chosen for the fixed part of the wind farm noise limit. Restricting the operation of wind farms to 40 dB when the background sound is louder provides no benefit to nearby residents, and prevents verification of the wind farm sound level.

In addition to the fixed part of the noise limit, both the 1998 and new 2010 versions of the Standard recommend a relative noise limit of the 'background sound level +5 dB', to provide a reasonable level of protection for noise sensitive activities while acknowledging the variable effects of wind.



Wouldn't it be simpler just to keep wind turbines a minimum physical distance away from homes?

A number of factors combine to affect the level of sound from a wind farm heard at a given location:

- the shape of the land and ground cover
- speed and direction of the wind
- ambient sound levels
- acoustic characteristics of the sound itself
- the number, size and type of turbines in a wind farm.

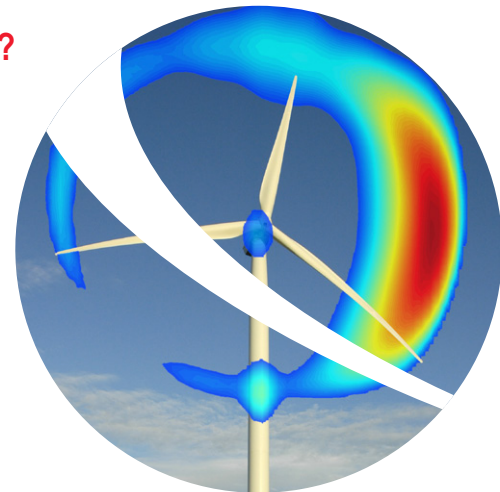
For this reason a set physical distance on its own would not be sufficient to ensure residents were protected from unreasonable noise, unless it were made so large as to prevent reasonable wind farm development. The Standard provides a way of determining the actual noise effects of a wind farm given these many factors and its application will ensure that residents are not exposed to unreasonable sound levels.

SOUND FROM WIND FARMS

What types of sound can I expect to hear from a wind farm?

Wind turbines produce a variety of sounds including aerodynamic sound from rotating blades (for example, swishing or whooshing sounds), and mechanical sound from the generator and gearbox, which may have a characteristic tone. Both types of sound are covered by the Standard and can be measured by sound level equipment.

The measured sound level at a given location will vary depending on factors such as wind speed and direction, distance from the wind farm, and wind conditions at noise sensitive locations.



How loud is 40 dB outside?

An external sound level of 40 dB would be typical of a quiet residential area with only light traffic, and natural sounds such as the wind in trees. In contrast, sound levels alongside busy urban roads would typically be around 55 - 65 dB during the day, and about 45 - 55 dB during the night.

What level could wind farm sound be inside my bedroom?

Recommendations in both the 1998 and new 2010 versions of NZS 6808 are based on the World Health Organization guideline noise limit of 30 dB L_{Aeq} inside bedrooms. This equates to the noise limit in the Standard of 40 dB $L_{A90(10\ min)}$ outside noise sensitive locations.

APPLICATION OF NZS 6808:2010

Who is expected to use the Standard?

The Standard has been developed for use by those involved in the prediction, measurement, and assessment of sound from wind farms. This includes wind farm developers, acoustics specialists, territorial authorities who monitor compliance with resource consent conditions, and others involved in ensuring that wind farm noise limits are technically correct, reasonable, and are able to be monitored to ensure compliance.

Will the Standard apply to all types of wind turbine?

The Standard generally applies to wind turbines with a swept rotor area greater than 200 m² (for example, individual blade lengths greater than approximately 8 m). Wind turbines with a smaller swept area are generally covered by the provisions of Standards relating to general environmental noise (NZS 6801 and NZS 6802), although they may require special measurement procedures to account for the effects of wind noise.

Local authorities may choose to apply this Standard (NZS 6808), in whole or in part, to small wind turbines.

What sort of protection does the Standard provide for people who live near a wind farm?

The limits recommended in the Standard are intended to provide a reasonable level of protection against sleep disturbance and maintain a reasonable amenity at locations surrounding a wind farm.

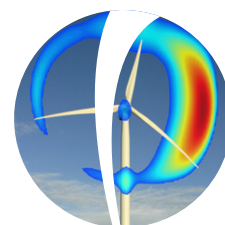
Application of the Standard will avoid significant adverse effects at homes and other locations near wind farms. It will not necessarily result in the sound from wind farms being inaudible. People living near a wind farm may still hear the wind farm, but if the limits recommended in the Standard are properly applied the level of sound will not be unreasonable.

Are the noise limits in the Standard enforceable?

New Zealand Standards are voluntary. They have no force of law unless they have been referred to as a condition or means of compliance in legally enforceable tools such as regulations, district plan rules, or included as part of resource consent conditions.

It is common practice for Standards such as this one to be used as the basis for setting consent conditions relating to noise limits, and how such limits are to be monitored. In this way the noise limits in the Standard become enforceable, usually by the territorial authority (city or district council) for the area. The Standard has been specifically written with such application under the Resource Management Act 1991 in mind.

The original NZS 6808:1998 was used as the basis for conditions for all wind farms granted consent since its release. The 2010 version is likely to be the basis for consent condition for all newly consented wind farms in New Zealand.



The 2010 version of the Standard includes model consent conditions designed to ensure correct implementation. When included in a consent or designation these conditions would provide the territorial authority with practical enforcement measures.

Will the revised Standard apply to existing wind farms?

No, existing wind farms will have to comply with the noise-related conditions that were set when they were granted resource consent.

The revised Standard is expected to form the basis of noise-related consent conditions for all newly consented wind farms in New Zealand.

Who is responsible for monitoring compliance with, and enforcing, a wind farm's noise limits?

Generally, territorial authorities have responsibility under the Resource Management Act 1991 for the control of noise within their districts. In most cases environmental noise control requirements and limits will be specified in a territorial authority's District Plan.

Wind farm operators will usually have to comply with noise control conditions specified in their resource consents, and these conditions may initially require the wind farm operator to monitor sound levels at noise sensitive locations and report results to the territorial authority to ensure compliance with limits. In addition, a territorial authority may undertake its own monitoring to assess compliance.

Who do I contact if I have a complaint about wind farm noise?

Complaints about wind farm noise may be directed to the wind farm operator or to the territorial authority of the area where the wind farm is located.

DEVELOPMENT OF NZS 6808:2010

Who was involved in the Standard's development?

The committee that developed this Standard consisted of 12 representatives nominated by the following organisations:

Energy Efficiency and Conservation Authority	New Zealand Acoustical Society
Executive of Community Boards	New Zealand Institute of Environmental Health Inc.
Local Government New Zealand	New Zealand Wind Energy Association
Massey University	Resource Management Law Association
Ministry for the Environment	The University of Auckland
Ministry of Health	

The committee included engineering and scientific experts in acoustics, practitioners in planning, resource management and environmental health, wind farm developers, and individuals who represented local authority and community interests. Each nominating organisation had one vote on the final Standard.



This Standard represents the best efforts of the committee to find a solution to all issues raised. The consensus view of the committee is that the Standard provides a reasonable way of protecting health and amenity of nearby noise sensitive locations, without unreasonably restricting the development of wind farms. (One member of committee did not agree with the consensus of the majority of representatives.)

What did the committee base their decisions on?

At the start of the revision process the committee collated and read all relevant scientific literature on wind farm sound. This included recent papers on alleged health effects. During the revision process further information that arose was also considered, including papers presented at an international wind farm sound conference in 2009.

When preparing the revision the committee then combined their extensive practical experience of wind farm sound with the reviewed literature. Where there was an area of debate, the committee turned back to the scientific evidence and analysed and tested that evidence to determine the appropriate resolution.

What thought has the committee given to the alleged health effects of exposure to sound from wind turbines?

When drafting the Standard the committee considered a wide range of published material on the effects of wind farm noise on people's health, including effects of low frequency sound. The committee determined that, based on available evidence at the time the Standard was drafted, the noise limits in the Standard provide protection against adverse health effects.

What opportunity did the public have to comment on the Standard?

The committee began its work in July 2008 and produced a draft Standard for public comment in February 2009. The public comment period lasted 2 months. A total of over 600 comments were received from a wide range of submitters. Each comment was reviewed by the committee and, where appropriate, changes were made to the draft before the committee reached consensus on the final published version of the Standard.

WHERE TO GET MORE INFORMATION

The Standard

Order or download NZS 6808:2010 from www.standards.co.nz, email enquiries@standards.co.nz, or call 0800 782 632.

Related Standards

- NZS 6801:2008 *Acoustics – Measurement of environmental sound*
- NZS 6802:2008 *Acoustics – Environmental noise*
- NZS 6803:1999 *Acoustics – Construction noise*
- NZS 6805:1992 *Airport noise management and land use planning*
- NZS 6806 *Acoustics – Road traffic noise – New and altered roads* (in development)
- NZS 6807:1994 *Noise management and land use planning for helicopter landing areas*
- NZS 6809:1999 *Acoustics – Port noise management and land use planning*

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