

# Wind Turbine Noise Limits

We are offering two choices here. **Option One** is the barebones, simple version of what is needed in an effective Ordinance. See the Town of Newport (NC) [Zoning Ordinance](#), Article IX ¶ 9-6.1(c) which is a good example of its implementation... **Option Two** is for those who want more technical details and was derived from the Appendix of this wind [Noise Study](#)... Use these words as a basis to create your own law to address this critical matter: Copy-Paste-Edit...

## Acoustical Regulations: Option One

### 1. General Clause

Sound levels from the operation of any wind turbine in the Wind Energy Facility (WEF) shall not exceed LAeq 35 dBA at the WEF property line. The 35 dBA limit is intended to act as a proxy for restricting low level noise (infrasound) generated by the WEF.

### 2. Requirements

- a. All instruments must meet ANSI or IEC Class 1 integrating sound level meter performance specifications.
- b. Procedures must meet ANSI S12.9, IEC61400-11 and ISO1996-2
- c. Procedures should meet ANSI, IEC and ISO standards applicable to the measurement of sound or its characteristics.
- d. IEC 61400-11 procedures are not suitable for enforcement of these requirements.

### 3. Definitions

ANSI S12.9 Quantities and Procedures for Description and Measurement of Environmental Sound, Parts 1 to 6.

IEC 61400-11 Wind turbine generator systems—Part 11: Acoustic noise measurement techniques.

ISO 1996-2 Acoustics—Description, measurement and assessment of environmental noise—Part 2: Determination of environmental noise levels.

LA90 , LA10 Statistical measures calculated under ANSI S12.9.

LAeq, LCEq Time average levels calculated under ANSI S12.9 or ISO 1996-2.

## Acoustical Regulations: Option Two

### 1. Audible Sound Limit

- a. Wind turbine(s) are not permitted to increase the pre-construction background sound levels by more than 5 dBA. Background sound levels are defined by the pre-construction quietest nighttime measured LA90 (sound exceeded 90% of the time). All sound levels shall be measured using “fast” meter setting, continuously sampling at 0.125 milli-seconds or faster over 10-minute intervals. LA90 results are valid when the LA10 results are no greater than 15 dBA above LA90 for the same time interval. All Noise Sensitive Receptors (NSR = residence or residential accommodation premises of any type), shall be identified by the wind developer and include the worst-case wind turbine predicted sound emissions in LAeq and LCeq when the turbine is at full power output.
- b. Test sites are to be located near NSR property line(s) of the Wind Energy Facility (WEF).
- c. A 5 dB penalty shall be applied for pure-tone(s) as defined in IEC 61400-11 at the turbine and ISO1996-2 at any affected NSR.
- d. A 5 dB penalty is applied for amplitude modulation as defined herein. When wind turbine(s) noise has an audible and noticeable variation in loudness that is perceived by a listener or complainant. Amplitude modulation is the modulation of the level of broadband noise emitted by a turbine at blade passing frequency. Amplitude modulation will be deemed greater than expected if the following characteristics apply:
  - i) A change in the measured LAeq, 125 ms turbine noise level of more than 3 dB (represented as a rise and fall in sound energy levels each of more than 3 dB) occurring within a 2 second period.
  - ii) The change identified in (i) above shall not occur less than 5 times in any one minute period provided the LAeq, 1 minute turbine sound energy for that minute is not below 28 dB.
  - iii) The changes identified in (i) and (ii) above shall not occur for fewer than 6 minutes in any hour.

Noise emissions are measured outside a NSR and shall be measured within 100 feet from the relevant NSR building, not closer than 12 feet to any reflective building or surface, and at least 5 feet from the ground.

## 2. Low Frequency Sound Limit

- a. The L<sub>Ceq</sub> and LC<sub>90</sub> sound levels from the wind turbine at the receiving NSR shall not exceed the lower of either:
  - i) L<sub>Ceq</sub> -LA<sub>90</sub> greater than 20 dB outside any NSR, or
  - ii) A maximum not-to-exceed sound level of 50 dBC measured as the background sound level (LC<sub>90</sub>) from the wind turbines without other ambient sounds for NSRs located at one mile or more from State Highways or other major roads or measured as the background sound level (LC<sub>90</sub>) for NSRs closer than one mile.
- b. These limits shall be assessed using the same nighttime and wind/ weather conditions required in 1(a). Turbine operating sound emissions (L<sub>Aeq</sub> and L<sub>Ceq</sub>) shall represent worst-case sound emissions for stable night-time conditions with low winds at ground level and winds sufficient for full operating capacity at the hub.

## 3. General Clause

- a. Sound levels from the operation of any wind turbine in the WEF shall not exceed L<sub>Aeq</sub> 35 dBA within 100 feet of any NSR.
- b. The monitoring shall include all the sound levels as required by these noise conditions and shall include monitoring for the characteristics described in Annex A of IEC 61400-1 including infrasound, low-frequency noise, impulsivity, low-frequency modulation of broad-band or tonal noise, and other audible characteristics. Wind speed and wind direction shall be measured at the same location as the noise monitoring location.

## 4. Requirements

- a. All instruments must meet ANSI or IEC Class 1 integrating sound level meter performance specifications.
- b. Procedures must meet ANSI S12.9, IEC61400-11 and ISO1996-2
- c. Procedures should meet ANSI, IEC and ISO standards applicable to the measurement of sound or its characteristics.
- d. Measurements must be made when ground level winds are 2m/s (4.5 mph) or less.
- e. IEC 61400-11 procedures are not suitable for enforcement of these requirements except for the presence of tones near the turbine.

## 5. Definitions

ANSI S12.9 Quantities and Procedures for Description and Measurement of Environmental Sound, Parts 1 to 6.

IEC 61400-11 Wind turbine generator systems—Part 11: Acoustic noise measurement techniques.

ISO 1996-2 Acoustics—Description, measurement and assessment of environmental noise—Part 2: Determination of environmental noise levels.

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