

Evaluation Guide to Solve Low Frequency Noise Problems

1. Scope

The scope of this Evaluation Guide is to provide guidance in dealing with complaints of rattling, mental and physical discomfort attributable to low frequency noise from stationary sources in plants, worksites, shops, neighborhood residences, etc. according to the guidance.

2. Reference Values to Counter Complaints about Low Frequency Noise

This Evaluation Guide provides reference values in two categories, namely complaints of rattling and complaints of mental and physical discomfort, to appropriately counter complaints about low frequency noise.

2.1 Reference Values for Complaints of Rattling

The reference values for complaints of rattling are as listed in Table 1.

Table 1 Reference Values for Complaints of Rattling

1/3 Octave-band Center Frequencies (Hz)	5	6.3	8	10	12.5	16	20	25	31.5	40	50
1/3 Octave-band Sound Pressure Level (dB)	70	71	72	73	75	77	80	83	87	93	99

2.2 Reference Values for Complaints of Mental and Physical Discomfort

The reference values for complaints of mental and physical discomfort are as listed in Table 2 and include the G-weighted sound pressure level of $L_G=92$ (dB).

Table 2 Reference Values for Complaints of Mental and Physical Discomfort

1/3 Octave-band Center Frequencies (Hz)	10	12.5	16	20	25	31.5	40	50	63	80
1/3 Octave-band Sound Pressure Level (dB)	92	88	83	76	70	64	57	52	47	41

3. Measurement

3.1 Measurement Methods

In principle, the measurement methods are in accordance with the “Measurement Manual for Low frequency Noise (by the Atmosphere and Life Bureau of the Ministry of Environment issued on October 2000. It is uploaded at <http://www.env.go.jp/air/teishuha/manual/index.html>)” (in Japanese) and the “Guidance” to counter low frequency noise problems.

3.2 Measurement Position

(1) Measurement Position for Complaints of Rattling

Measure noises at a position one or two meters away from the building such as a residence outside a complainant’s house.

(2) Measurement Position for Complaints of Mental and Physical Discomfort

Measure noises at a position in the relevant room of the complainant’s residence in which mental and physical problems are caused. When measuring the noise, close every window, as a rule.

3.3 Measurement Value

The measurement value shall be at the G-weighted sound pressure level of L_G (dB) and 1/3 octave-band sound pressure level of $L_{p,1/3oct}$ (dB).

3.4 Frequency Range for Measurement

Use the frequency range from the frequency of 1 Hz to 80 Hz within the 1/3 octave band for the measurement.

3.5 Calculation Method for Measurements Results

3.5.1 1/3 Octave-band Sound Pressure Level

(1) Stationary Low Frequency Noises

If a sound pressure level is constant or the fluctuation range is narrow, calculate the power average of $\bar{L}_{p,1/3oct}$ at 1/3 octave band sound pressure level for around 10 seconds to a minute.

If the sound pressure level fluctuates due to wind, etc., measure the sound pressure level at the position least influenced by wind to avoid such fluctuation as much as possible, and then calculate the average of $\bar{L}_{p,1/3oct}$ of the 1/3 octave band sound pressure level.

(2) Fluctuating Low Frequency Noise

If the sound pressure level fluctuates by over 5 dB. Take the maximum 1/3 octave band sound pressure level of $\bar{L}_{p1/3oct,max}$ enough times to be certain (5 or 10 times) to calculate the power average 1/3 octave band sound pressure level of $\bar{L}_{p1/3oct,max}$.

3.5.2 G-weighted Sound Pressure Level

(1) Low Frequency Noise with Narrow Fluctuation Range

If a sound pressure level is constant or the fluctuation range is narrow, calculate the power average of $\bar{L}_{p,G}$ of the G-weighted sound pressure level for around 10 seconds to a minute.

If the G-weighted sound pressure level fluctuates due to wind, etc., measure the sound pressure level at the position least influenced by wind to avoid such fluctuation as much as possible, and then calculate the power average of $\bar{L}_{p,G}$ of the G-weighted sound pressure level.

(2) Fluctuating Low Frequency Noise

If the sound pressure level fluctuates by over 5 dB. Take the maximum G-weighted sound pressure level of $\bar{L}_{p,G}$ enough times to be certain (five or 10 times) to calculate the power average of $\bar{L}_{p,G}$ of G-weighted sound pressure level.

4. Evaluation Methods

4.1 Evaluation Methods for Complaints of Rattling

- (1) Comparing the 1/3 octave band sound pressure level of low frequency noise to the reference values in Table 1, if they are higher than or equal to these values, there is a possibility of complaints about low frequency noise.
- (2) Where the 1/3 octave band sound pressure level of low frequency noise is below the reference value at every frequency, examine if there are ground vibrations, etc. to take any possible factors into consideration for the evaluation.

4.2 Evaluation Methods for Complaints of Mental and Physical Discomfort

- (1) Where the G-weighted level is 92 dB or higher, there is a possibility of complaints against the infrasound.
- (2) Comparing the 1/3 octave band sound pressure level of low frequency noise to the reference values in Table 2, if they are higher than or equal to these values, there is a possibility of complaints about low frequency noise.
- (3) If the relevant case falls under neither of the above paragraphs (1) or (2), there is a low possibility of low frequency noise problems. If so, examine if there is noise of 100 Hz or higher, ground vibrations, etc. to identify any possible factors necessary for the evaluation.

5. Warnings

When using this Evaluation Guide, pay attention to the following:

- The reference values specified in the Evaluation Guide are different from the standard criteria and required limits.
- The reference values specified in the Evaluation Guide are applied to the case of complaints possibly due to low frequency noises irrespective of use zoning of the city plan and the regional indices as specified in the Noise Control Law.
- The reference values specified in the Evaluation Guide are set to deal with complaints probably attributable to low frequency noises from stationary sources. In light of this, these values are not applied to low frequency noise emitted from sources including moving sources such as

transportation facilities, events associated with these noise source facilities and explosive noise sources such as blasting, bursting, etc.

- The reference values specified in the Evaluation Guide are set to deal with complaints probably ascribable to low frequency noises. They are, however, not intended for target values, for environmental preservation in environmental evaluation or work environment guidelines. To counter the noise, it is necessary to thoroughly consider many factors of technical possibilities, etc.

6. Others

The Evaluation Guide also includes the “Interpretation of Evaluation Guide” for technical solutions to low frequency noise problems, which is separately developed to properly and smoothly counter complaints possibly attributable to low frequency noise.