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Acoustics -- In-situ determination of insertion loss of outdoor noise barriers of all types

Acoustique -- Détermination in situ de la perte par insertion de tous types d'écrans antibruit en milieu extérieur

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INTERNATIONAL STANDARD

ISO 10847

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Acoustics — *In-situ* determination of insertion loss of outdoor noise barriers of all types

Acoustique — Détermination in situ de la perte par insertion de tous types d'écrans antibruit en milieu extérieur

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10847 was prepared by Technical Committee ISO/TC 43, Acoustics, Subcommittee SC 1, Noise.

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Acoustics — *In-situ* determination of insertion loss of outdoor noise barriers of all types

1 Scope

This International Standard specifies methods for the determination of insertion loss of outdoor noise barriers intended to shield various kinds of noise sources. It specifies detailed procedures for *in-situ* measurement of barrier insertion loss including microphone positions, source conditions and acoustic environments of the measurement sites.

This International Standard allows one to measure the insertion loss of a given noise barrier in a given site and including given meteorological conditions. It does not make it possible to compare insertion loss values of an equivalent barrier on a different site. It can be used for comparing insertion loss values of different types of barriers on a same site and under given meteorological conditions by the direct method.

This International Standard gives a method for determining insertion loss:

- a) from the level difference before and after the installation of noise barriers and when this is not possible because a barrier has already been installed,
- b) using an indirect method to estimate the sound pressure levels before installation of the barrier by measurement at another site which has been judged to be equivalent. <u>SIST ISO 10847:1998</u>

For equivalent sites, close match is required in source characteristics, microphone locations terrain profiles ground surface characteristics, surrounding artificial structures and meteorological conditions. This International Standard prescribes principles for ensuring that sufficiently equivalent conditions are maintained between "before" and "after" cases to permit certain, reliable and repeatable determination of barrier insertion loss.

This International Standard does not cover the determination of the intrinsic acoustic quantities of the barrier, for example the sound reduction index and the sound absorption coefficient. The equivalent continuous A-weighted sound pressure level, the A-weighted sound exposure level, the octave or one-third-octave band sound pressure level and/or maximum sound pressure level are used as noise descriptors.

This International Standard can be used for routine determination of barrier performance or for engineering or diagnostic evaluation. It can be used in situations where the barrier is to be installed or has already been installed.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 651:1979, Sound level meters.

IEC 804:1985, Integrating averaging sound level meters.

IEC 942:1988, Sound calibrators.

IEC 1260:1995, Electroacoustics - Octave-band and fractional octave-band-filters.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 sound pressure level, L_p :

Ten times the logarithm to the base 10 of the ratio of the square of the sound pressure to the square of the reference sound pressure, in decibels.

NOTE — The reference sound pressure is 20 μ Pa. The frequency weighting or the width of the frequency band used is to be indicated.

3.2 equivalent continuous sound pressure level, $L_{peq,T}$:

Sound pressure level, in decibels, of a continuous steady sound that, within a measurement time interval T, has the same mean-square sound pressure as a sound under consideration whose level varies with time; it is given by the following equation:

$$L_{peq,T} = 10 \log \left[\frac{1}{T} \int_{t_1}^{t_2} \frac{p^2(t)}{p_0^2} dt \right] dB$$

where

 t_1 and t_2 are times corresponding to the beginning and end of the measurement time interval;

 $T = t_2 - t_1$; **iTeh STANDARD PREVIEW**

p(t) is an instantaneous sound pressure standards.iteh.ai)

 p_0 is the reference sound pressure (20 µPa). <u>SIST ISO 10847:1998</u>

NOTE — The frequency weighting or the width of the frequency band used is to be indicated; for example, equivalent continuous A-weighted sound pressure level $L_{pAeg,r}^{/a}$ equivalent continuous octave-band sound pressure level, etc.

3.3 A-weighted sound exposure level, L_{AE} .

The sound exposure level, in decibels, of a discrete noise event is given by the equation

$$L_{AE} = 10 \, \text{lg} \left[\frac{1}{T_0} \int_{t_1}^{t_2} \frac{p_A^2(t)}{p_0^2} \, \text{d}t \right] \, \text{dB}$$

where

 $p_{A}(t)$ is an instantaneous A-weighted sound pressure;

 $(t_2 - t_1)$ is a stated time interval long enough to encompass all significant sound of a stated event;

- p_0 is the reference sound pressure (20 μ Pa);
- T_0 is the reference duration (1 s).

3.4 maximum sound pressure level, L_{pmax}:

The maximum A-weighted, or octave or one-third-octave-band sound pressure level, in decibels, determined with time weighting S (slow) or F (fast) according to IEC 651.

NOTE — The time weighting used is recorded and reported.

3.5 insertion loss of barriers, D_{μ} :

Difference, in decibels, in sound pressure levels at a specified receiver position before and after the installation of a barrier provided that the noise source, terrain profiles, interfering obstructions and reflecting surfaces, if any, ground and meteorological conditions have not changed.

NOTE — The frequency weighting or the width of frequency band and the time weighting used are to be indicated; for example, insertion loss of barrier corresponding to equivalent continuous A-weighted sound pressure levels $(D_{\mu,Aeg})$.

3.6 background noise level:

Sound pressure level, in decibels, at a reference position or receiver position without any noise source in operation.

3.7 source position:

Point at which the source is located (for stationary source), an area in which sources are located or move (for stationary and mobile sources), or a line along which sources are located or move (for stationary and mobile sources).

3.8 reference position:

Point at which the sound from the source is or will be minimally influenced by the installed barrier or planned barrier.

NOTE — The reference position will be used to monitor the source level.

3.9 receiver position:

Point at which an insertion loss is to be determined; the location of this position is not standardized but is chosen based on the objectives of a particular study.

3.10 far field:

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Region in which the sound pressure level for a simple point source decays six decibels per doubling distance and for an incoherent line source three decibes per doubling distance, without ground attenuation.

4 Methods https://standards.iteh.ai/catalog/standards/sist/a883f2c7-ddce-4b2b-bd1c-7acd20ed1d02/sist-iso-10847-1998

This International Standard specifies two methods for the determination of insertion loss of outdoor noise barriers. The recommended method is the direct method. The alternative method is the indirect measurement method using measured "before" levels at an equivalent site.

The method to be adopted is chosen by considering several factors including the objectives of the measurement, the ability to make measurements prior to barrier installation, and the feasibility of equivalence of source, terrain profile, interfering obstructions and reflecting surfaces, if any, ground surface and meteorological conditions between the "before" and "after" situations.

4.1 Direct method

The direct method can only be used if the barrier has not yet been installed or can be removed for the "before" measurements. The sound pressure levels are measured at the reference and the receiver positions for both "before" and "after" barrier installations. The same reference and receiver positions shall be used in both the "before" and "after" cases. Equivalence shall be satisfied on sources, terrain profiles, interfering obstructions and reflecting surfaces, if any, ground surface and meteorological conditions.

4.2 Indirect measurement method

If the barrier has been installed and it cannot be readily removed to permit direct "before" measurement, an estimated "before" sound pressure level is obtained by the measurement at a site that is equivalent to the study site.

Site equivalence refers to equivalence of the source, the terrain profiles, interfering obstructions and reflecting surfaces, if any, ground surface and meteorological conditions.