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Acoustics — Framework for calculating a distribution of sound exposure levels for impulsive sound events for the purposes of environmental noise assessment

Acoustique — Cadre pour le calcul d'une distribution des niveaux d'exposition sonore pour les sons impulsionnels pour les besoins de l'évaluation du bruit environnemental

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Foreword

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The main task of technical committees is to prepare International Standards. 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.

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ISO 13474 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

It cancels and replaces ISO/TS 13474:2003, which has been technically revised.

Introduction

The aim of this International Standard is to provide a framework for the evaluation of descriptor quantities for use in environmental noise assessment. Part of this framework includes an engineering method for calculating a statistical distribution of event sound exposure levels at locations which are some distance from high-energy impulsive sound sources. It is specifically intended for environmental noise assessment and not for the assessment of the risk of damage to buildings or the risk of injury to animals or people.

In ISO 9613-2, the immission level from sources such as traffic and industry is calculated for a so-called “downwind” condition. The long-term average level is estimated using a correction factor, C_{met}. This concept holds for distances where sound from such sources is assessed as environmental noise. ISO 9613-2 excludes impulses in its scope and holds only for A-weighting, for near-ground sources and receivers and for distances up to about 1 000 m. For high-energy impulsive sound sources, the impulsive sound event duration is short, and low frequencies are more prominent than for traffic and industrial sound sources. Lower-frequency sounds are generally less attenuated over a given distance in the atmosphere than higher frequencies and, as a consequence, the level-influencing effects of propagation over much larger distances need to be taken into account.

A general outline is given of a method that takes into account ground reflection, shielding by topography and the meteorological effects of refraction and turbulence. Starting from the source strength, this method calculates a distribution of immission levels for a set of replica atmospheres, each replica being a specific combination of atmospheric-absorption class and excess-attenuation class. To carry out practical calculations using the procedure, it is useful to exploit the statistical contribution of the meteorological and ground surface conditions. In particular, histograms of the frequencies of occurrence of the wind velocity, wind direction, temperature, humidity and atmospheric stability can be used to describe the classes. From the distribution of the immission levels, a number of assessment metrics can be obtained. For instance, the long-term averaged immission level can be calculated as a weighted average. The weighting factors are determined by the probability of occurrence of each replica atmosphere during the relevant time period for the location of interest.