

A PREVIEW OF THE DRAFT CSA GUIDELINE - NOISE EMISSION DECLARATIONS FOR MACHINERY

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1.0 Introduction

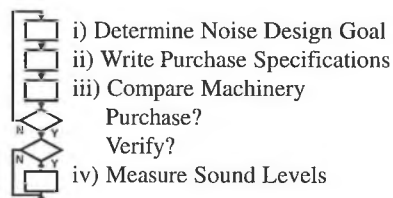
Workplace noise is a major occupational health problem that results in thousands of disability claims per year. Community noise from workplaces can also be a significant source of annoyance. Industry works hard to avoid these concerns and to have a quiet workplace. The basic requirement for a quiet workplace is quiet machinery. Noise emission declarations assist the purchaser of quieter machinery by enabling manufacturers to formally provide sound level data in an agreed format.

To help reduce workplace and environmental noise, the Canadian Standards Association (CSA) is producing a guideline on noise emission declarations for machinery. The draft CSA guideline's recommendations are consistent with the requirements for the sale of machinery in the European Union (EU) as given in the EU Machinery Directive (EU directives are available from the Delegation of the European Commission in Canada, Ottawa, Ontario). The CSA document also provides guidance on the use of the series of measurement, declaration and verification standards of the International Organization for Standardization (ISO) (ISO standards are available from the Standards Council of Canada, Ottawa, Ontario). A worked example is provided to give step-by-step technical guidance on the use of the ISO measurement standards in a realistic scenario.

This paper provides excerpts from the draft CSA guideline to illustrate its use and to elicit further feedback from the acoustical community. For reference purposes the CSA guideline must be used; the excerpts in this paper are not an acceptable substitute.

2.0 Guidance For Purchasers

The starting points for use of the guideline are flow charts, one for purchasers and another for manufacturers. The steps for the purchaser are:



i) Determine noise goal - The first step is to determine the noise design goal. For general plant areas the typical design criterion for employee exposure is 85 dBA. This value is generally used by industry even where the province does not yet require it, and organizations such as NIOSH and ACGIH recommend the use of 85 dBA. The CSA guideline also provides recommendations for unoccupied areas, lunch rooms, offices, outdoors, and nearby residences.

ii) Write purchase specification - The second step is the writing of

purchase specifications. The draft CSA guideline provides a description of purchase specifications; an example is also given, referring to harmonized ISO standards. It is advantageous to use these standards as the basis for a purchase specification because they provide a convenient means for manufacturers to make measurements and prepare technical reports. Also, the EU Machinery Directive stipulates that conformity is presumed if these standards are used

The noise specification should contain the maximum acceptable declared sound pressure level. Generally this level should be at least 5 dB below the regulated noise limit to be met, i.e. 80 dBA at 1 m is typically used if the employee exposure goal is 85 dBA. This difference is necessary because declared levels are obtained under controlled conditions for a single source, whereas the sound level encountered in the workplace includes contributions from multiple reflections and many sources. Where applicable, the corresponding sound power level should also be contained in the noise specification.

iii) Compare machinery - Next the purchaser must compare machinery. It is recommended that comparisons of noise emission data be based on the declared single-number values, which consist of a measured value plus the associated uncertainty. A small percentage of machines in a batch are expected to have noise emission values exceeding the declared value. Even for measurements made on a single machine, there is a small probability that the noise emission value will exceed the declared value.

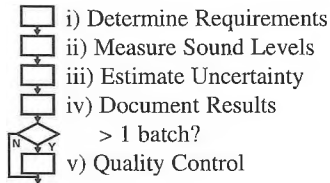
The ISO harmonized standards allow machinery to be compared independent of the original measurement environments. However, it is important to make comparisons for operating conditions that are as close as possible. Use of the test code written for the class of machinery (e.g. electric motors), provides standard operating conditions and other machine specific recommendations for the tests. When a test code is not available, the CSA guideline provides recommendations on operating conditions.

Knowing which standard was used allows the measurement uncertainty to be estimated from tables in the CSA guideline. All other aspects being equal, noise emission values with a lower uncertainty are preferred.

iv) Measure sound levels - The decision to purchase and verify machinery may involve additional steps. If noise emission values are verified by measurement, the conditions and method of measurement of sound levels must be as close as possible to those required from the manufacturer. For verification of a single machine, the measured value should be less than the declared value. However, when using only one machine to verify an entire batch, the measured value should be 3 dB lower than the declared value. More details on verification are given in the guideline.

3.0 Guidance For Manufacturers

The flowchart for a manufacturer has the following steps:



i) Determine requirements - A noise emission declaration must appear in the operating instructions and documentation for the machinery. The declaration must contain the identification of the machinery, relevant operating conditions, the measurement method and reference to the standards used.

The information provided in a noise emission declaration includes the A-weighted sound pressure level, L_p , if the measured L_p plus uncertainty exceeds 70 dBA. The A-weighted sound power level is also required if the measured L_p plus uncertainty exceeds 85 dBA. In addition, for impulsive sounds, the C-weighted peak sound pressure level is also required if the measured value plus uncertainty exceeds 130 dBC peak. These requirements are consistent with those of the European Union Machinery Directive. Sound power level is required for the EU Outdoor Machinery Directive. The guideline contains excerpts from these Directives to indicate the many types of machines covered and some of the particular requirements for these machines. For example, some machines require the involvement of notified bodies to satisfy European marketing requirements. More details are provided in the CSA guideline.

ii) Measure sound levels - The next step is to measure the machinery noise levels. For a batch of machines, measurements may be made on a sample, instead of every machine. It is strongly recommended to use the CSA guideline and the referenced ISO standards for determination of the declared levels. This will also allow conformity with the existing European Union Machinery Directive and the EU Outdoor Machinery Directive. References to the pertinent standards and Directives, including points of contact for obtaining these documents, are given in the draft CSA guideline.

The operating, installation and mounting conditions of the machine would normally be specified in an ISO or European Committee for Standardization (CEN) noise test code. The conditions are typically reproducible and representative of the noisiest operation in typical usage. ISO and CEN are preparing test codes to ensure comparable and consistent operation of 800 different types of machines. The draft CSA guideline outlines recommended conditions to be used if a test code is not currently available. The guideline provides detailed technical guidance for selection of ISO measurement standards. A worked example is provided for additional guidance.

The standards most commonly used are ISO 11201 and ISO 3744 for sound pressure level and sound power level measurements, respectively. These standards provide for engineering grade measurements in an essentially free field above a reflecting plane. In the guideline, the suitability of these standards for given measurement conditions is summarized based on the floor characteristics, room size, room characteristics, background noise, and the distance to walls, pipes, and other small/large fixtures. Additional guidance is

provided for 7 alternate standards.

Sound pressure measurements are made at the operator's position. For sound power measurements, nine or more measurements are made over an imaginary rectangular box that completely encloses the source. The box sides must be at least 25 cm away from the surface of the source. More detailed guidance on measurement positions is provided in the guideline.

iii) Estimate Uncertainty - Estimation of measurement uncertainty is the next step. The guideline illustrates how uncertainty is estimated from the accuracy of the measurement method and the repeatability of the machinery operation. Typically, for an engineering grade measurement, the uncertainty will work out to 5 dB, and for survey grade the uncertainty is 8 dB.

iv) Document results - For auditing purposes, the machinery manufacturer should maintain a technical file. This is a requirement for EU regulatory purposes. This file should include information on the operating conditions of the machinery during measurements and a statement of the noise test codes, standards and methods used to make the measurement. If harmonized ISO standards were not used, then the file should also contain the calculation notes, test results, etc., required to defend the noise emission declaration and the rationale for the use of a method other than specified in a harmonized ISO standard.

v) Quality control - When there is more than one batch of machines being produced, the manufacturer is advised to implement a quality control program. This is essentially a continuous verification process. Verification was briefly summarized above and more details are given in the draft CSA guideline.

4.0 Current Status

The guideline has been circulated in two drafts to a group of stakeholders and made available to subscribers of a popular Canadian e-mail list on Health and Safety (Health & Safety Canada [HS-Canada@list.ccohs.ca]). It is now in its 4th draft and has been approved by the CSA Industrial Noise Subcommittee who have passed it on to the Editorial Subcommittee for review, and to the Main Committee for balloting. The final guideline is expected to be published in 2002.

e-mail s bly@hc-sc.gc.ca to request a draft for review purposes.