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ANSI Technical Report for Machines –

Sound Level Measurement Guidelines

A guide for measuring, evaluating, documenting and reporting sound levels emitted by machinery

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Sound Level Measurement Guidelines

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Foreword

This ANSI Technical Report was developed to provide useful and practical guidance to the supplier and user of machines to accurately assess the sound level(s) generated by the machines or machine production systems. Publication of this ANSI Technical Report has been approved by the Accredited Standards Developer – AMT-The Association For Manufacturing Technology. This document is registered as a Technical Report according to the *Procedures for the Registration of ANSI Technical Reports*. This document is not an American National Standard and the material contained herein is informative, not normative in nature.

Excessive sound exposures can, in some cases, result in a loss of hearing. These findings resulted in the promulgation of federal regulations which specifically established occupational and environmental sound level exposure limits. Therefore, reducing the amount of sound generated by machine tools has become another important design parameter for the machine supplier. To achieve that objective, all of the materially affected and interested parties (machine builders, component manufacturers, end-users, consultants etc.) involved must communicate using the same terms and procedures.

To that end, in 1969 the National Machine Tool Builders Association (now, AMT-The Association For Manufacturing Technology) established a committee for the task of preparing an industry standard which would delineate suggested measuring techniques and procedures for determining sound emanating from machine tools.

In 1970, the first edition of this document was published; it recommended a uniform method for measurement of sound created by machine tools. The technique was very simple and in the ensuing years, it became widely accepted. Machine tool builders became familiar with the system for measuring the sound created by the machines and purchasers of machines began to reference the technique when they issued purchasing specifications for machinery.

With use of the standard over a few years, modification and “fine tuning” of the measurement technique became desirable. Therefore, the ad hoc committee was re-established in 1973 to update the document. The second edition of the industry standard on measurement techniques was published in 1976. Since that time, the standard has enjoyed wide acceptance and use in general industry by suppliers and many end users, particularly in the specifications of equipment and machines.

In early 2002, the ANSI B11 Accredited Standards Committee began discussing the potential need to revisit this (at that time, nearly 25+ year old) industry standard, and agreed to: 1) update and revise the document, and 2) elevate the status and developmental rigor of the document by incorporating it into the B11 series of machine safety documents as an ANSI Technical Report. The ANSI B11.TR5 Subcommittee first met in June 2004, and by April 2005 essentially completed this Technical Report.

Since the purpose of this document is to explain methods for measuring and recording machine sound levels that are most compatible with actual conditions encountered in industry, references to newer techniques in sound measurement and analysis are included. Therefore, a discussion of time-weighted average sound levels has been added (Annex B) to assist the reader in understanding the sound dosage concept embodied in the Occupational Safety and Health Administration (OSHA) regulations. Note that at this time a disagreement exists between OSHA and the Environmental Protection Agency (EPA) as to the basis for computing sound dosage. However, this document takes no position regarding the controversy; Annex B has been incorporated for reference purposes only.

This Technical Report is divided into four basic sections: Measurement (clause 4), Evaluation (clause 5), Documentation (clause 6), and Reporting (clause 7), and includes Annexes with reference information including a sample recording/documentation form, schematic measurement envelope, and 3/5 dB doubling allowable sound exposure, as well as an explanation of equivalent sound pressure levels and estimating average levels.

Since certain aspects of the noise problem lack definition, this document should be used as a guide, capable of being modified to suit the particular test situation. This document will be amended to incorporate improved techniques and procedures as they are developed.

Suggestions for improvement of this technical report are welcome and should be sent to: AMT, 7901 Westpark Drive, McLean, VA 22102-4206, Attention: Safety Director.

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Sound Level Measurement Guidelines

A guide for measuring, evaluating, documenting and reporting sound levels emitted by machinery

1 Scope

This Technical Report specifies methods for measuring, evaluating and documenting sound pressure levels emitted by a machine or machine production system(s) during normal operation and when running at idle. This technical report provides guidance for measuring and recording machine sound pressure levels that are the most compatible with the actual conditions encountered in industry, and allows the user to select equipment using 'buy-quiet purchase specifications' or to estimate the effect particular machinery will have on existing sound pressure levels once it is installed in the user's facility.

Sound pressure levels emitted by machines or machine production systems is frequently referred to as "noise." This Technical Report considers the terms "Noise" and "Sound" as synonymous.

2 References

The following references were either used as a basis for developing this document, or are good reference sources that may be consulted for additional information on a particular topic.

ANSI S1.4- 1983(R2001) *Specification for Sound Level Meters*

ANSI S1.43- 1997 (R2002) *Specification for Integrating Averaging Sound Level Meters*

ANSI S1.13- 1995 (R1999) *Measurement of Sound Pressure Levels in Air*

ANSI S3.4- 1980 (R2003) *Procedure for the Computation of Loudness of Noise*

ANSI S12.19-1996 (R2001), *Measure of Occupational Noise Exposure*

ANSI S12.7-1986 (R1998), *Methods for Measurement of Impulse Noise*

The Noise Manual, 5th Edition, American Industrial Hygiene Association, Fairfax, VA 2003

29 CFR 1910.95 *Occupational Noise Exposure* (OSHA)

Industrial Noise Control Manual, NIOSH Technical Report 79-117, National Institute for Occupational Safety and Health (NIOSH), Cincinnati, OH 1978

Threshold Limit Values for Chemical Substances and Physical Agents (2005). See section on physical agents, noise, and ultrasound exposure. American Conference of Governmental Industrial Hygienists (ACGIH) Worldwide, Cincinnati, Ohio

3 Definitions

3.1 acoustic reflections: Sound waves reflected by surfaces in the area of the machine being measured and having a direct effect on the measurement levels.