Designation: E1124 – 10 (Reapproved 2016)

Standard Test Method for Field Measurement of Sound Power Level by the Two-Surface Method[1]

This standard is issued under the fixed designation E1124; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the field, or *in situ* measurement of sound power level by the two-surface method. The test method is designed to minimize the effects of reverberant conditions, directivity of the noise source under consideration, and the effects of ambient noise from other nearby equipment operating at the same time.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C634 Terminology Relating to Building and Environmental Acoustics

2.2 *ANSI Standard:*[3]

S1.4 Specification for Sound Level Meters

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology C634.[4]

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *conformal surface*—the locus of points which lie at a fixed distance from the reference surface of a piece of equipment. Two conformal surfaces are used in this test method. These are surfaces over which the measuring microphones are swept. They are located at two different distances from the equipment. Fig. 1 shows a typical arrangement of these surfaces for a generalized piece of equipment.

3.2.2 *constituent surface area*—a portion of the conformal surface.

4. Summary of Test Method

4.1 The average one-third or full octave band sound pressure levels are measured over two different conformal surfaces which envelop the equipment. These conformal surfaces should be selected to consist of rectangular, cylindrical, and hemispherical constituent surfaces so that the surface areas may be easily calculated. From the difference between the two average sound pressure levels taken at each surface and from the areas of the surfaces, the sound power level may be calculated. The calculation accounts for both the effect of the reverberant field and the noise of other equipment. It is permissible to define conformal surfaces that completely envelope the source, yet only measure over a portion of the conformal surface due to restrictions from process connections or accessibility.

5. Significance and Use

5.1 The function and operation of equipment in the field often preclude the measurement of the free-field sound pressure levels of a single piece of equipment in the absence of interfering sound from other equipment operating at the same time. The two-surface method will provide, in most cases, a reliable estimate of the normal sound power levels of a specimen operating in an adverse environment.

5.2 This test method is intended for use in the field in the presence of what is normally regarded as interfering background noise. This test method is based upon the work of Hubner [5,6] and Diehl,[7] but differs from all other current sound

[1] This test method is under the jurisdiction of ASTM Committee E33 on Building and Environmental Acoustics and is the direct responsibility of Subcommittee E33.08 on Mechanical and Electrical System Noise.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Terminology C634 – 85 was the edition used during the development of this test method.

[5] Hubner, G., "Analysis of Errors in Measuring Machine Noise Under Free Field Conditions," *Journal of the Acoustical Society of America*, Vol 54, No. 4, 1973, pp. 967–977.

[6] Hubner, G., "Qualification Procedures for Free Field Conditions for Sound Power Determination of Sound Sources and Methods for the Determination of the Appropriate Environmental Correction," *Journal of the Acoustical Society of America*, Vol 61, No. 2, 1977, pp. 456–464.

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