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Standard Test Method for Measurement and Reporting of Masking Sound Levels Using A-Weighted and One-Third-Octave-Band Sound Pressure Levels¹

This standard is issued under the fixed designation E1573; 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.

INTRODUCTION

This test method is one of a set of standards relating to the acoustical performance of components or systems in open and closed office settings. The other standards in this set deal with the measurement of the sound attenuation between work stations provided by partial height space dividers, vertical surfaces, acoustical ceiling systems; and speech privacy in open and closed spaces.

1. Scope

1.1 This test method specifies the procedure used to measure the masking sound in terms of A-weighted and one-third-octave-band sound pressure levels.

1.2 The results of this test method can be used to determine if and where the masking sound meets (or does not meet) a particular specification.

1.3 This test method does not evaluate the overall acoustical environment. It is intended only to measure and report the masking sound levels.

1.4 The values stated in SI units are to be regarded as standard. The values in parentheses are for information only.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards*:²

C634 Terminology Relating to Building and Environmental Acoustics

E1374 Guide for Office Acoustics and Applicable ASTM Standards

2.2 *IEC Standards*:³

IEC 61260:1 Electroacoustics - Octave-band and fractional-octave-band filters - Part 1: Specifications

IEC 61672:1 Electroacoustics - Sound Level meters - Part 1: Specifications

NOTE 1—The IEC standards are often adopted by national standards organizations as national standards sometimes with additional unique national standards numbers assigned.

3. Terminology

3.1 Terms used in this standard are defined either in Terminology **C634** or within this standard. The definitions of terms explicitly given within this standard take precedence over definitions given in Terminology **C634**. The definitions within Terminology **C634** and this standard take precedence over any other definitions of defined terms found in any other documents, including other documents referenced in this standard.

¹ This test method is under the jurisdiction of ASTM Committee **E33** on Building and Environmental Acoustics and is the direct responsibility of Subcommittee **E33.02** on Speech Privacy.

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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 International Electrotechnical Commission (IEC), 3, rue de Varembe, 1st Floor, P.O. Box 131, CH-1211, Geneva 20, Switzerland, <http://www.iec.ch>.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *masking sound, n*—sound that reduces the intelligibility of speech and the distraction of activity noise.

3.2.1.1 *Discussion*—Masking sound is produced and controlled most effectively by an electronic sound masking system.

3.2.2 *sound masking system, n*—electronic equipment and loudspeakers used to generate, distribute, and control masking sound throughout a treated area.

4. Summary of Test Method

4.1 The conformity of the masking sound to a specified curve and level is determined by measuring the A-weighted sound level and the one-third-octave-band sound pressure levels at sufficiently representative locations with a sound level meter and comparing these values to specified levels.

5. Significance and Use

5.1 Acoustical performance is dependent on many factors (see Guide E1374 for a discussion on general office acoustical considerations). One of these factors is the masking sound. The masking spectrum shape and level must conform within specified tolerances throughout the treated area. The measurement and recording of these parameters are addressed in this test method.

5.2 The results from this test method are used to determine if the masking sound meets a particular specification.

6. Test Space

6.1 The test space shall include the entire area of the building served by the masking system.

6.2 The ceiling system of the test space shall be completely finished, including light fixtures and air diffusers.

6.3 The floor covering and all wall finishes shall be completely installed prior to testing.

6.4 All interior furnishings shall be in place.

6.5 The test space shall be unoccupied during the tests.

7. Test Signal

7.1 The test signal used for this evaluation may be any of the following:

7.1.1 The sound due to the HVAC system and the sound masking system combined, or

7.1.2 The sound due to the sound masking system alone, or

7.1.3 The sound due to the HVAC system alone.

7.2 For the case described in 7.1.1, the test procedures shall be conducted with the sound masking system and all other background sound sources operational. The HVAC system shall be operated at its normal daytime condition.

7.3 For the case described in 7.1.2, the test procedures shall be conducted with the sound masking system only. Noise generated by other background sound sources shall be at least 10 dB below the masking signal in all respective one-third-octave-bands. The HVAC system shall be shut off and any remaining sounds that may interfere with the measurements shall be noted in the report.

7.4 If the intent is to measure the sound generated only by the HVAC system and other building sources, the HVAC system and other sound sources shall be operated at their normal daytime conditions.

7.5 Sound masking features such as adaptive level adjustment or programmable timer shall be deactivated and set to the specified base levels during measurements.

NOTE 2—Testing the HVAC system alone will typically occur in order to verify the need for electronic sound masking and conversely, to determine the areas within a facility where the HVAC levels may already exceed ideal masking sound levels.

NOTE 3—When the masking system is measured without the HVAC as per 7.1.2, the subsequent restoration of the HVAC may result in combined ambient noise levels that are unacceptable to the occupants.

8. Test Instrumentation and Microphone Positioning

8.1 Instrumentation Specification:

8.1.1 The sound level meter or analyzer shall be an integrating-averaging type with appropriate microphone that conforms to class 1, IEC 61672:1-2013 requirements.

8.1.2 The measurement system shall include one-third-octave-band filters that conform to IEC 61260:1-2014 for class 1.

8.1.3 Test data may be acquired on-site or recorded for later analysis. The combined frequency response and other characteristics of the measurement system and recording device shall meet the class 1 requirements of IEC 61672:1-2013.

8.2 Microphone Orientation and Positioning:

8.2.1 The measurement system will typically include a 12.7 mm ($\frac{1}{2}$ in.) microphone which will have either a free-field or random incidence inherent directivity response and the system may include electronic circuitry allowing the microphone to simulate either directivity response. Results above around 5000 Hz can be influenced by the microphone directivity response, the degree of diffusivity of the sound field, and the orientation of the microphone if the field is not highly diffuse. These concerns can be avoided by use of a 6.4 mm ($\frac{1}{4}$ in.) microphone. For indoor measurements, it is often assumed that the field is diffusive, and a random incidence response microphone or setting is preferred with the orientation insignificant. Use of a free-field microphone in such fields will result in slightly low readings at higher frequencies. Large open plan spaces may not be diffuse. Especially if it is clear to the ear that the dominant sound is from above, it is preferable in such spaces to use either a free-field response with the microphone pointed upward, or a random-incidence response with the microphone pointed at about 45° above the horizontal. The microphone directivity response and orientation shall be provided in the report.

8.2.2 The center of the microphone sweep position(s) shall be at ear-height for the average seated person which is 1.2 m (4 ft) above the floor.

8.2.3 The microphone sweep position(s) shall be selected if possible so that all measurements are at least 1 m (3.3 ft) from any reflective surfaces such as walls, columns, desks, or office furniture. In the event that this criterion cannot be met with the specified sweep diameter, measurements may be as close as 0.5 m (1.6 ft) from surfaces. If the distance between reflecting