Designation: E 1574 – 98

Standard Test Method for
Measurement of Sound in Residential Spaces[1]

This standard is issued under the fixed designation E 1574; 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 provides guidance to the methodology used in the measurement of building interior sound levels.

1.2 This test method describes procedures for measuring sound in enclosed residential spaces produced by built-in utilities and major appliances such as plumbing, heating, ventilating, air-conditioning systems, refrigerators, and dish washers. The measured values may then be used to assess compliance, design, or habitation suitability.

1.3 This test method does not promulgate or recommend acoustical criteria.

1.4 This test method is not intended for obtaining data to evaluate indoor environments for:

1.4.1 Commercial activities such as studios, communication centers, hospitals, and auditoria, and

1.4.2 Effects from exterior sources such as aircraft, railroad operations, motor vehicles, mining operation, weapons fire, etc.

1.5 This test method is not intended for evaluating sound transmission loss, sound absorption coefficient, or any other acoustical aspects of the space or structure.

1.6 *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:*
C 634 Terminology Relating to Environmental Acoustics[2]
2.2 *ANSI Standards:*[3]
S1.4 Specification for Sound Level Meters
S1.11 Specification for Octave-Band and Fractional-Octave

Analog and Digital Filters
S1.40 Specification for Acoustical Calibrators

3. Terminology

3.1 *Definitions*—For definitions of acoustical terms used in this standard see Terminology C 634.

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *background noise*—to include sound propagating to the measurement space from sources which are not under control of the proprietor or occupant of the measurement space. See Terminology C 634.

3.2.1.1 *Discussion*—Examples include external utilities, traffic, and activity in adjacent residences.

3.2.2 *highest transient sound*—a sound characterized by a brief excursion of pressure level which exceeds the ambient or steady sound.

3.2.2.1 *Discussion*—The transient sound may be accompanied by steady sound; for example, flushing of toilets or furnace start-up. The highest transient sound is the maximum excursion of the sound product by the source of interest during the source on-off cycle.

3.2.3 *measurement space*—residential spaces with a defined boundary, usually a room or hallway, in which acoustical data are to be acquired. Although the space may have a defined boundary, it does not have to be an enclosing boundary.

3.2.3.1 *Discussion*—For example; an L-shaped living room/dining room would be considered two spaces—living room and dining room.

3.2.4 *source of interest*—a source which is part of the residence and which propagates sound into the measurement space.

3.2.4.1 *Discussion*—Typical sources of interest are built-in utilities such as plumbing, heating, ventilating, air-conditioning systems, and major appliances.

3.2.5 *source sound*—the sound pressure level at a point produced solely by the source of interest.

3.2.6 *steady sound*—a sound whose pressure level remains substantially constant during the period of observation when measured with the *slow* setting on the sound level meter.

3.2.6.1 *Discussion*—Examples are a forced air blower and a water pump.

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[1] This test method is under the jurisdiction of ASTM Committee E-33 on Environmental Acoustics and is the direct responsibility of Subcommittee E33.08 on Mechanical and Electrical System Noise.

Current edition approved Sept. 10, 1998. Published March 1999. Originally published as E 1574 – 94. Last previous edition E 1574 – 95.

[2] *Annual Book of ASTM Standards,* Vol 04.06.

[3] Available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

4. Summary of Test Method

4.1 This test method is a procedure for quantifying the sound from sources identified as the cause or potential cause of noise complaints in residential spaces.

4.2 The sound generated by the source of interest may be steady, transient, or a mixture of the two. For each source of interest the steady sound and the highest transient sound are measured.

4.2.1 *Steady Sound*— The measurement space is surveyed and the point at which the highest utilities-generated A-weighted, slow response sound level occurs is located (see 9.1). The octave band and A-weighted sound levels at this point are measured and reported.

4.2.2 *Highest Transient Sound*—The highest utilities-generated A-weighted, fast response sound level is measured at the center of each measurement space and reported.

4.2.3 These procedures are repeated in all measurement spaces and for all sources, or combination of sources, of interest.

5. Significance and Use

5.1 This is an in situ method, that is, the measurements are made at the actual installation. The sound levels measured according to this test method should be representative for that installation and for the quantity of acoustical absorption actually, permanently present.

5.2 The test method has the following limitations:

5.2.1 The test method produces sound data which may be compared with applicable criteria or limits only if they are in terms of the quantities measured in this test method.

5.2.2 The test method does not quantify certain subjective aspects of the sound environment that may be objectionable. These include pure tones, spectral content, and temporal distribution.

6. Measurement Space

6.1 The measurement space shall be any space, individual room, or enclosed portions of the residential space that are intended to be occupied by people.

NOTE 1—Examples of spaces expected to be measured are bedrooms, living rooms, kitchens, and finished basements. Examples of spaces that are not expected to be measured are utility closets, closets, and carports. Examples of spaces that may or may not be measured are garages, unfinished basements, and hallways.

6.2 For new construction, the measurements shall be made with the space configured in the completed, but unfurnished, state.

6.3 For currently inhabited spaces, the measurements shall be made as furnished.

6.4 Absorptive material shall not be added to the space solely for the purpose of influencing the measurements.

7. Measurement Location

7.1 The microphone height shall be between 1.1 and 1.3 m above the floor, the approximate average of the sleeping, standing, and seated ear heights of an individual.

7.2 The microphone shall be located no closer than 1 m to any wall or other extended surface, except in spaces narrower

than 2 m where the measurement shall be at a location equidistant from the closest opposing walls. If the source of interest (built-in utility or appliance) protrudes from the extended surface, the measurement shall not be made closer than 1 m from the source.

7.3 The reported measurement shall be made at the location within each measurement space that meets the above requirement and produces the highest sound level during the survey.

7.4 The measurements shall be made with the minimum number of people in the measurement space. Personnel shall not occupy the direct line of sight between the source of interest and the sound level meter.

8. Instrumentation

8.1 The sound measurement system shall meet the requirements of ANSI S1.4 for Type 1 sound level meters.

8.2 Octave band or fractional band filters shall meet the requirement of ANSI S1.11, Type 2, Order 3, or higher. If 16 000 Hz measurements are to be made, a Type 1 filter must be used.

8.3 Acoustic calibrators shall meet the requirements of ANSI S1.40.

8.4 If measurements are to be made in a stream of moving air such as generated by a forced air heating system or air conditioner, place a windscreen over the microphone. The motion of air over the microphone of the sound level meter can cause local air turbulence noise at the microphone. The meter will respond to this turbulence noise and produce an erroneous reading. Placing a windscreen over the microphone will reduce this local turbulence.

NOTE 2—A windscreen having a diameter of at least 7 cm is recommended.

9. Measurement Procedures

9.1 *Determining the Location of Sound Level Maximum*—Survey each measurement space of interest to find the location of the maximum A-weighted, slow response sound level produced by each sound source or combination of sources of interest. Walk slowly and quietly, first at 1 m from the inside boundary of the space, then at concentric paths about 1 m apart, while observing the sound levels. Note the location and sound level in the space where the level is the highest.

NOTE 3—An alternate method is to measure and record at fixed intervals such as 1 m, then note the highest level.

9.2 *Measurement Procedure for Steady Sound*—In each measurement space, repeat the following procedure for each source or combination of sources of interest:

9.2.1 Place the microphone in the measurement space at the location of the sound level maximum as determined in 9.1.

9.2.2 Measure the combined source sound and background noise. With the source of interest operating and all other controllable sound sources off, measure the octave band sound pressure level in each band from 31.5 Hz to 8000 Hz inclusive, using the slow response on the sound level meter or average sound level for periods depending on the octave band as follows: 40 s for the 31.5 Hz band, 20 s for the 63 Hz band, 9 s for the 125 Hz band and 5 s for bands above 125 Hz.

NOTE 4—The measurement may be made in 1/3-octave bands and the