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Standard Guide for Selection of Standards on Environmental Acoustics[1]

This standard is issued under the fixed designation E 1433; 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 guide is intended to assist acoustical consultants, architects, specifiers, and others in understanding ASTM standards in environmental acoustics, so that building specifications and other documents can accurately refer to relevant standards. The full standards are found in alphanumeric order in Volume 04.06 of the *Annual Book of ASTM Standards*.

1.2 The scope of Committee E-33 is: "The development of standards on the characteristics and performance of materials, products, systems, and services relating to the acoustical environment and the promotion of related knowledge." Only standards under the jurisdiction of Committee E-33 are included in this guide. Additional standards related to environmental acoustics may be found under the jurisdiction of other ASTM committees.

1.3 None of the discussions herein is sufficiently detailed to substitute for reading the full standard. Only a careful reading of a standard will provide a complete understanding of its function. This guide is specifically **NOT** to be used as a direct reference in building specifications. Only the original standard gives sufficient information to serve as a specification reference.

2. Referenced Documents

2.1 *ASTM Standards:*

C 367 Test Methods for Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-In Ceiling Panels[2]

C 384 Test Method for Impedance and Absorption of Acoustical Materials by the Impedance Tube Method[2]

C 423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method[2]

C 522 Test Method for Airflow Resistance of Acoustical Materials[2]

C 634 Terminology Relating to Environmental Acoustics[2]

C 635 Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings[2]

C 636 Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels[2]

E 84 Test Method for Surface Burning Characteristics of Building Materials[3]

E 90 Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions[2]

E 336 Test Method for Measurement of Airborne Sound Insulation in Buildings[2]

E 413 Classification for Rating Sound Insulation[2]

E 477 Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers[2]

E 492 Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine[2]

E 497 Practice for Installing Sound-Isolating Lightweight Partitions[2]

E 557 Practice for Architectural Application and Installation of Operable Partitions[2]

E 580 Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint[2]

E 596 Test Method for Laboratory Measurement of the Noise Reduction of Sound-Isolating Enclosures[2]

E 597 Practice for Determining a Single-Number Rating of Airborne Sound Isolation for Use in Multi-Unit Building Specifications[2]

E 717 Guide for Preparation of the Accreditation Annex of Acoustical Test Standards[2]

E 756 Test Method for Measuring Vibration-Damping Properties of Materials[2]

E 795 Practices for Mounting Test Specimens During Sound Absorption Tests[2]

E 859 Test Method for Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members[3]

E 966 Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Facade Elements[2]

E 989 Classification for Determination of Impact Isolation Class (IIC)[2]

[1] This guide is under the jurisdiction of ASTM Committee E-33 on Environmental Acoustics and is the direct responsibility of Subcommittee E33.04 on Application of Acoustical Materials and Systems.

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

[3] *Annual Book of ASTM Standards*, Vol 04.07.

E 1007 Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures[2]
E 1014 Guide for Measurement of Outdoor A-Weighted Sound Levels[2]
E 1041 Guide for Measurement of Masking Sound in Open Offices[2]
E 1042 Classification for Acoustically Absorptive Materials Applied by Trowel or Spray[2]
E 1050 Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones, and a Digital Frequency Analysis System[2]
E 1110 Classification for Determination of Articulation Class[2]
E 1111 Test Method for Measuring the Interzone Attenuation of Ceiling Systems[2]
E 1123 Practice for Mounting Test Specimens for Sound Transmission Loss Testing of Naval and Marine Ship Bulkhead Treatment Materials[2]
E 1124 Test Method for Field Measurement of Sound Power Level by the Two-Surface Method[2]
E 1130 Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index[2]
E 1179 Specification for Sound Sources Used for Testing Open Office Components and Systems[2]
E 1222 Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems[2]
E 1264 Classification for Acoustical Ceiling Products[2]
E 1265 Test Method for Measuring Insertion Loss of Pneumatic Exhaust Silencers[2]
E 1289 Specification for Reference Specimen for Sound Transmission Loss[2]
E 1332 Classification for Determination of Outdoor-Indoor Transmission Class[2]
E 1374 Guide for Open Office Acoustics and Applicable ASTM Standards[2]
E 1375 Test Method for Measuring the Interzone Attenuation of Furniture Panels Used as Acoustical Barriers[2]
E 1376 Test Method for Measuring the Interzone Attenuation of Sound Reflected by Wall Finishes and Furniture Panels[2]
E 1408 Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems[2]
E 1414 Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum[2]
E 1503 Test Method for Conducting Outdoor Sound Measurements Using a Digital Statistical Analysis System[2]
E 1573 Test Method for Evaluating Masking Sound in Open Offices Using A-Weighted and One-Third Octave Band Sound Pressure Levels[2]
E 1574 Test Method for Measurement of Sound in Residential Spaces[2]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms pertaining to acoustics used in this guide, see Terminology C 634.

4. Significance and Use

4.1 Each current standard under the jurisdiction of Committee E-33 on Environmental Acoustics is listed, divided into sections under the jurisdiction of the various subcommittees as follows:

E33.01 on Sound Absorption
E33.02 on Open Plan Spaces
E33.03 on Sound Transmission
E33.04 on Application
E33.05 on Research
E33.06 on International Standards
E33.07 on Definitions and Editorial
E33.08 on Mechanical and Electrical System Noise
E33.09 on Community Noise

4.2 The ASTM designation, title, use, result or purpose, and a brief summary of each standard is provided. These give enough explanation about the standard to permit one to understand its application, and to differentiate one standard from another.

NOTE 1—The sequence of these standards does not indicate their relative importance. The user is encouraged to carefully assess the applicability of standards to a situation and select the documents most suited to the circumstances. Comments given may assist in selecting the standard best suited to a specific need.

DESCRIPTION OF STANDARDS

5. Sound Absorption

5.1 Sound absorption is the dissipation of sound energy, typically within a room or space. The scope of Subcommittee E33.01 on Sound Absorption is: "the development of test methods and specifications for the sound absorption and other physical properties of materials, products, and systems as designed or used for the absorption of airborne sound."

5.1.1 *Test Method C 384—Test Method for Impedance and Absorption of Acoustical Materials by the Impedance Tube Method*:

5.1.1.1 *Use*—Intended primarily as a research screening tool, useful for manufacturers and/or researchers in evaluating the absorption of materials. It is also valuable for evaluating small units, such as anechoic wedges. It can be used to rank order the absorption and impedance characteristics of materials.

5.1.1.2 *Result*—Normal Incidence Sound Absorption Coefficients, Normal Specific Impedance Ratios.

5.1.1.3 *Discussion*—A sound wave traveling down a tube is reflected back by the test specimen, producing a standing wave that can be explored with a probe microphone. The normal absorption coefficient is determined from the standing wave ratio. In addition, an impedance ratio at any one frequency can be determined using the position of the standing wave with reference to the face of the specimen (see also Test Method E 1050). Values do not necessarily correlate with those of Test Method C 423.

5.1.2 *Test Method C 423—Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method*:

5.1.2.1 *Use*—Primary method for evaluating sound absorption capabilities of building materials and systems. One can use the sound absorption coefficients and volume of a room, or

Sabins per unit, to determine how much material is needed to limit room reverberation or reduce noise to a desired level, or both.

5.1.2.2 *Result*—Sound Absorption Coefficients, Noise Reduction Coefficient (NRC), Absorption figures in Sabins, Sabins/Unit.

5.1.2.3 *Discussion*—Random noise is turned on long enough for the sound pressure in a reverberant room to reach a steady state. When the signal is turned off, the sound pressure level decreases. The rate of decrease (decay) in a specified frequency band is measured. The absorption of the room and its contents is calculated both before and after placing the specimen in the room. The increase in absorption due to the specimen, divided by the area of the specimen is the absorption coefficient. Noise Reduction Coefficient is the average of the four absorption coefficients of the third-octave bands centered on 250, 500, 1000, and 2000 Hz, rounded to the nearest 0.05. NRC is a single number rating and is convenient for ranking building materials and systems. However, in some critical applications, study of all available frequency data is advised to determine suitability.

5.1.3 *Test Method C 522—Test Method for Airflow Resistance of Acoustical Materials*:

5.1.3.1 *Use*—Indicates sound absorbing properties in some materials where airflow resistance is related to sound absorption.

5.1.3.2 *Result*—Airflow resistance (R), Specific Airflow resistance (r), Airflow resistivity (r_0).

5.1.3.3 *Discussion*—The specific airflow resistance of an acoustical material is one of the properties that determine its sound-absorptive and sound-transmitting properties. The specific air flow resistance is given by the formula $R = P/U$, where P = air pressure difference across the specimen, U = volume velocity of airflow through it. The specific airflow resistance measured by this method may differ from the specific resistance measured by the impedance tube method in Test Method C 384.

NOTE 2—**Caution:** Materials exist that do not allow any airflow yet exhibit excellent sound absorption.

5.1.4 *Practices E 795—Practices for Mounting Test Specimens During Sound Absorption Tests*:

5.1.4.1 *Use*—Reference to specific mounting methods helps laboratory operators simulate expected field applications. It also helps specifiers by allowing comparison of materials tested in similar mountings.

5.1.4.2 *Result*—A letter designation describing the method of mounting a Test Method C 423 test specimen.

5.1.4.3 *Discussion*—These practices cover test specimen mountings to be used during tests performed in accordance with Test Method C 423. Sound absorption of a material covering a flat surface depends not only on the physical properties of the material, but also on the way in which the material is mounted over the surface. The mountings specified in these practices are intended to simulate, in the laboratory, conditions that exist in normal use.

5.1.5 *Test Method E 1050—Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones, and a Digital Frequency Analysis System*:

5.1.5.1 *Use*—This is not just an alternative to Test Method C 384 using digital instruments. It is a completely different method, but is used to find a value for the same property. Test Method C 384 can also use digital instruments.

5.1.5.2 *Result*—Normal Incidence Sound Absorption Coefficients, Normal Specific Acoustic Impedance Ratios.

5.1.5.3 *Discussion*—A broadband noise is produced on one end of a tube, the other end of which contains a test specimen. The plane wave produced is detected by two microphones located at different positions along the tube. A digital frequency analyzer measures the output from the two microphones. Results match Test Method C 384.

6. Open Plan Spaces

6.1 Open Plan spaces represents a specialized area of environmental acoustics in which sound absorption, surface reflections, and transmission loss all play important roles. The scope of Subcommittee E33.02 is "development of test methods and practices relating to materials, products, and systems used for the control of acoustics in open plan spaces, such as offices, schools, etc."

6.1.1 *Guide E 1041—Guide for Measurement of Masking Sound in Open Offices*:

6.1.1.1 *Use*—Measures variation of masking sound over time and throughout a space, and its correlation to a specified sound spectrum. Can be used as an acceptance or problem-solving tool by specifiers.

6.1.1.2 *Result*—Spatial and temporal uniformity.

6.1.1.3 *Summary*—This guide describes the measurement of masking sound in an open office environment. The masking sound will usually be associated with a masking system. However, in certain positions and frequency ranges, HVAC equipment may affect or determine the masking sound spectrum. While intended primarily for open offices, this guide has been effectively used in closed, or mixed open and closed, offices.

6.1.2 *Classification E 1110—Classification for Determination of Articulation Class*:

6.1.2.1 *Use*—Provides a single figure rating that can be used for comparing building systems for speech privacy. The rating is designed to correlate with transmitted speech intelligence between office spaces.

6.1.2.2 *Result*—Articulation Class (AC).

6.1.2.3 *Summary*—Weighting factors are applied to the one-third octave band attenuation data determined in Test Methods E 1111, E 1375, E 1376, and others of the series. The weighted data are then totaled and rounded to the nearest multiple of ten to yield the Articulation Class (AC). A single number rating is convenient for ranking building materials and systems. However, for critical applications, a study of all available frequency is advised to determine suitability.

6.1.3 *Test Method E 1111—Test Method for Measuring the Interzone Attenuation of Ceiling Systems*:

6.1.3.1 *Use*—Provides measurements of the sound reflective characteristics of ceiling systems when used in conjunction with partial-height space dividers. It may also be used to rate full height space dividers when used in a mix of closed and open offices.

6.1.3.2 *Result*—Interzone attenuation.

6.1.3.3 *Summary*—The ceiling system test specimen may include ceiling board, ceiling grid, lights, HVAC outlets, and related items. It is restricted to measurements with a fixed space divider height of 1.50 m (60 in.), (or as otherwise designated), a ceiling height of 2.7 m (108 in.), a sound source height of 1.2 m (48 in.) and microphone positions at 1.2 m of height. The interzone attenuation is the difference, in decibels, in a given one third-octave band, between the measured reference level and the level measured at nominal interzone distance.

6.1.4 *Test Method E 1130—Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index*:

6.1.4.1 *Use*—Field test of speech privacy in an open office (or in a mixed open and closed office situation). It can be used as part of acceptance criteria for a completed office, or using a mock-up may be helpful in predicting the privacy in a planned layout.

6.1.4.2 *Result*—Articulation Index (AI).

6.1.4.3 *Summary*—The speech privacy between open offices is determined by the degree to which intruding speech sounds from adjacent offices exceed the ambient sound pressure levels at the listener's ear. This test method describes a means of measuring speech privacy objectively between locations in open offices, (or a mix of open and closed offices). It relies upon acoustical measurements, published information on speech levels, and standard methods for assessing speech privacy. It measures the overall performance of the office; it is not a component test.

6.1.5 *Specification E 1179—Specification for Sound Sources Used for Testing Open Office Components and Systems*:

6.1.5.1 *Use*—To specify the speaker requirements when testing open office speech privacy such as in Test Methods E 1111, E 1130 and other open office test procedures.

6.1.5.2 *Result*—Qualification test data for sources that meet specification.

6.1.5.3 *Summary*—Specific requirements for the sound source to be utilized when testing for speech privacy are provided along with the test criteria. It is primarily a test of the sound source directivity using a special qualification signal. Test signals required by open office test methods may differ.

6.1.6 *Guide E 1374—Guide for Open Office Acoustics and Applicable ASTM Standards*:

6.1.6.1 *Use*—This guide is intended to assist architects, engineers, office managers, and others in designing, specifying, or operating open offices.

6.1.6.2 *Result*—Guidelines and recommendations.

6.1.6.3 *Summary*—This guide delineates the role and interaction of the components in an open plan office acoustical environment and the achievement of speech privacy. Items addressed include; the ceiling, wall treatments, furniture and furnishings, HVAC system, and masking sound system, floors, lights, windows and other items that may affect speech privacy. This is a guide for design purposes only. It should not be referenced in a building specification. An evolving document, this guide addresses only obvious issues and does not cover all circumstances that affect speech privacy or the design process.

6.1.7 *Test Method E 1375—Test Method for Measuring the Interzone Attenuation of Furniture Panels Used as Acoustical Barriers*:

6.1.7.1 *Use*—This test method measures one of the relevant acoustical properties of one component of the open office environment, namely, the effectiveness of furniture panels as acoustical barriers.

6.1.7.2 *Result*—Interzone attenuation and Articulation Class in the Barrier position (AC_B).

6.1.7.3 *Summary*—This laboratory test method uses the same acoustical test chamber identified in Test Methods E 1110, E 1111, E 1376 and others in the open office test series. Modifications are made to standardize the ceiling and other elements and focus on the sound attenuation attributes of only the barrier. A standard size 5 ft-high barrier is placed between two typical work stations in an open office environment. Test results indicate the space divider for its effectiveness as an acoustical barrier. The barrier height and configuration may vary per design. Interzone attenuation is the difference, in decibels, in a given one-third octave band, between the measured reference level and the level measured at a nominal interzone distance. Results may be compared directly to ceiling and vertical wall test data. It is anticipated that the designer will specify the same AC for the ceiling, walls and space dividers in both the barrier and primary flanking position. Test Method E 1130 is available to evaluate the overall speech privacy between work stations for a completed interior system. This procedure specifically evaluates the space divider element of the interior system. Data is normally presented as interzone attenuation or Articulation Class in the Barrier position (AC_B).

6.1.8 *Test Method E 1376—Test Method for Measuring the Interzone Attenuation of Sound Reflected by Wall Finishes and Furniture Panels*:

6.1.8.1 *Use*—This test method measures one of the relevant acoustical properties of one component of the open office environment, namely, the effectiveness of furniture panels located in the reflective or "flanking" position.

6.1.8.2 *Result*—Interzone attenuation and Articulation Class (AC_F).

6.1.8.3 *Summary*—This laboratory test method uses the same acoustical test chamber identified in Test Methods E 1110, E 1111, E 1375 and others in the open office test series. Modifications are made to standardize the ceiling, barrier and other elements except the specimen when located in the flanking position (that is, where sound may reflect around the end of a barrier). A partial length of full high barrier is placed between two typical work stations in an open office environment and the standard size barrier is placed in the primary flanking position. Test results identify the specimen sound absorbing effectiveness in terms of interzone attenuation between two adjacent work stations. Data is normally presented as interzone attenuation and articulation class in the primary flanking position (AC_F). Results may be compared directly to the results for the ceiling and barrier wall test procedures. It is anticipated that the designer will specify the same AC for the ceiling, walls and space dividers in both the barrier and primary flanking position. Test Method E 1130 is available to evaluate the overall speech privacy between work stations for a completed interior system.

6.1.9 *Test Method E 1573—Test Method for Evaluating Masking Sound in Open Offices Using A-Weighted and One-Third Octave Band Sound Pressure Levels*:

6.1.9.1 *Use*—A field measurement procedure that can be used to evaluate spectrum shape compliance, plus spatial and temporal uniformity of masking sound in open offices.

6.1.9.2 *Result*—Masking sound spectrum: A-weighted or ⅓ octave bands, or both.

6.1.9.3 *Summary*—This test method is one of two standards that can be used to evaluate masking sound. The other is Guide E 1041 that provides an in depth evaluation of masking sound, usually in a laboratory or detailed field analysis. This procedure allows tests to be conducted using the A-weighting network of a sound level meter and provides a simplified procedure for measuring the ⅓ octave band sound pressure level spectrum of the masking sound. This test procedure was designed to be utilized by the architect, acoustician, facilities manager or owner, or all of these, to specify and test the sound masking system for compliance. Note that this is a test procedure. Actual criteria values must be provided by the specifier. See Guide E 1374 for guidelines on specifying masking systems.

7. Sound Transmission and Impact Noise

7.1 Sound transmission refers to the passage of sound energy through either air or other media (such as building structure, for example). The scope of Subcommittee E33.03 on Sound Transmission is: "the development of standards dealing with the sound transmission characteristics and performance of materials, products, and systems relating to the acoustical environment and the response thereto."

7.1.1 *Test Method E 90—Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions*:

7.1.1.1 *Use*—Primary method for evaluating transmission loss of materials and systems used in building construction, such as interior partitions, doors, windows, and floor/ceiling assemblies.

7.1.1.2 *Result*—Transmission Loss (TL) and Sound Transmission Class (STC).

7.1.1.3 *Summary*—A test specimen is installed in an opening between two adjacent reverberation rooms, care being taken that the only significant sound path between rooms is by way of the specimen. An approximately diffuse field is produced in one room, and the resulting space-time average sound pressure levels in the two rooms are determined at a number of one-third-octave band frequencies. In addition, the sound absorption in the receiving room is determined. The sound transmission loss is calculated from a basic relationship involving difference between the sound levels, the receiving room absorption, and the test specimen size. The TL data are used in Classification E 413 to determine sound Transmission Class (STC).

7.1.2 *Test Method E 336—Test Method for Measurement of Airborne Sound Insulation in Buildings*:

7.1.2.1 *Use*—Primary method for evaluating on-site noise reduction between two rooms or sound barrier performance of interior partitions. Can be used for acceptance of recent construction or improvement of existing buildings. It is not recommended to use test performance in one facility to predict results in another.

7.1.2.2 *Result*—Field Transmission Loss (FTL), Noise Reduction (NR), Normalized Noise Reduction (NNR).

7.1.2.3 *Discussion*—The noise reduction between two rooms is obtained by taking the difference between the average sound pressure levels in each room at specified frequencies in one-third-octave bands when one room contains a noise source. When the rooms' size and absorption requirements are satisfied so that the sound fields are sufficiently diffuse and when flanking is not significant, the field transmission loss may be reported. Note that this test requires minimum room characteristics to be valid (see also Test Method E 597). The data are used in Classification E 413 to determine Noise Isolation Class (NIC), Normalized Noise Isolation Class (NNIC), or Field Sound Transmission Class (FSTC).

7.1.3 *Classification E 413—Classification for Rating Sound Insulation*:

7.1.3.1 *Use*—Permits specifiers to rank the transmission loss or noise reduction performance of similar materials or systems, using data from one of several test methods.

7.1.3.2 *Result*—Sound Transmission Class (STC), Field Sound Transmission Class (FSTC), Ceiling Attenuation Class (CAC), Noise Isolation Class (NIC), Normalized Noise Isolation Class (NNIC).

7.1.3.3 *Summary*—To determine the Sound Transmission Class (STC) of a test specimen, its transmission loss (as determined in accordance with Test Method E 90), field transmission loss (see Test Method E 336), noise reduction (see Test Method E 336 or Test Method E 596), or normalized noise reduction (see Test Method E 336) in a series of 16 test bands, are compared with those of a reference contour. When certain conditions are met, the class is found. It is recommended that the test data be presented in a graph together with the corresponding class contour. The single number rating is convenient for ranking building materials and systems. However, it is appropriate only for commonly found indoor sounds similar to speech. For critical applications, study of all available frequency data is advised to determine suitability.

7.1.4 *Test Method E 596—Test Method for Laboratory Measurement of the Noise Reduction of Sound-Isolating Enclosures*:

7.1.4.1 *Use*—Evaluating personnel enclosures to be used in noisy environments.

7.1.4.2 *Result*—Noise Reduction (NR).

7.1.4.3 *Summary*—The enclosure to be tested is placed in a reverberation room and prepared for testing. The background noise levels inside the enclosure and in the reverberation room are measured in one-third octave bands. After bands of random noise are produced in the reverberation room, the sound pressure levels are measured at several points in the reverberation room and at appropriate points inside the enclosure. The noise reduction in each one-third octave band is the difference between the space-time-averaged sound pressure level in the reverberation room and the space-time-averaged sound pressure level inside the enclosure. The Noise Isolation Class may be determined from the data using Classification E 413.

7.1.5 *Practice E 597—Practice for Determining a Single-Number Rating of Airborne Sound Isolation for Use in Multi-Unit Building Specifications*:

7.1.5.1 *Use*—Determines the degree of acoustical isolation between and within dwelling units in apartment buildings, hotels, etc.

7.1.5.2 *Result*—Sound Level Difference (*D*), Normalized Sound Level Difference (D_n), Average Sound Level (*L*).

7.1.5.3 *Summary*—The sound level difference between two rooms is measured by establishing a sound field with specified spectrum in a source room, of sufficient level that the corresponding sound in a receiving room predominates over the sound from all other sources. With the sound source in operation, the space-time average A-weighted sound level, *L*, in each of the two rooms, is measured. The difference between the levels is the sound level difference, *D*, for that room pair. (This value may vary from the Noise Isolation Class (NIC); see Test Method E 336.) The sound level difference is a property of the two rooms and their contents, not of the dividing partition alone. Results will be lower than those found in Test Method E 90, since flanking paths and imperfections are not eliminated from the test.

7.1.6 *Guide E 717—Guide for Preparation of the Accreditation Annex of Acoustical Test Standards*:

7.1.6.1 *Use*—An accreditation annex identifies those elements that are critical to the proper conduct of the test method.

7.1.6.2 *Result*—Accreditation requirements.

7.1.6.3 *Summary*—This guide is intended to assist acoustical standards-writing groups in the preparation of laboratory accreditation annexes for acoustical test standards.

7.1.7 *Test Method E 756—Test Method for Measuring Vibration-Damping Properties of Materials*:

7.1.7.1 *Use*—This test method determines the vibration-damping properties of materials.

7.1.7.2 *Results*—Young's Modulus (*E*), Loss Factor (*LF*), Shear Modulus (*G*).

7.1.7.3 *Summary*—This test method is accurate over a frequency range of 50 to 5000 Hz and over the useful temperature range of the material being tested. It is useful in testing materials that have application in structural vibration, building acoustics, and the control of audible noise. Such materials include metals, enamels, ceramics, rubbers, plastics, reinforced epoxy matrices, and woods that can be formed to the test specimen configurations.

7.1.8 *Guide E 966—Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Facade Elements*:

7.1.8.1 *Use*—Field test guide for measuring noise isolation of exterior walls and facade components.

7.1.8.2 *Result*—Outdoor-Indoor Transmission Loss (OITL), Outdoor-Indoor Level Reduction (OILR).

7.1.8.3 *Summary*—Loudspeaker or traffic sound sources may be used. The outdoor sound field may be inferred from pre-calibration, or measured on site near the facade or at the facade surface. A fixed sound source is located at a specific angle, while traffic may move along a straight line in front of the facade. Indoors, a space average is taken in the room adjacent to the test facade. The difference between the two sound levels is OILR. (For uncontrolled sound sources and traffic, the outdoor and indoor sound levels are measured simultaneously.) To obtain OITL, OILR is normalized for room absorption, and flanking transmission paths must be blocked. If flanking transmission is present or unknown, the measurement is labeled the "apparent OITL" and represents the lower limit of noise isolation performance. Because of angle of incidence and flanking effects, results may not agree with those obtained with other test methods, such as Test Methods E 90 or E 336.

7.1.9 *Practice E 1123—Practice for Mounting Test Specimens for Sound Transmission Loss Testing of Naval and Marine Ship Bulkhead Treatment Materials*:

7.1.9.1 *Use*—Provides laboratory operators with methods to mount test specimens to best reflect their application in actual shipboard use.

7.1.9.2 *Result*—Standard mounting methods.

7.1.9.3 *Summary*—These practices describe test specimen mountings to be used for naval and marine ship applications during sound transmission loss tests performed in accordance with Test Method E 90. The sound transmission loss of a material covering a flat surface depends partially upon the structure to which it is mounted and the mounting method used. Naval architects require specific transmission loss characteristics of acoustical treatment materials as they will be used on board ships.

7.1.10 *Test Method E 1222—Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems*:

7.1.10.1 *Use*—Rank-order pipe lagging systems according to sound insertion loss in the laboratory.

7.1.10.2 *Result*—Insertion loss (IL) in dB at 100 Hz or one-third octave bands.

7.1.10.3 *Summary*—Sound source consisting of bands of white noise is inserted in the end of the pipe. Tests are conducted without any lagging and then with lagging. Results are compared with and without lagging to determine insertion loss. In the laboratory version tests are conducted in a reverberation room.

7.1.11 *Specification E 1289—Specification for Reference Specimen for Sound Transmission Loss*:

7.1.11.1 *Use*—Provides a reference specimen for laboratory sound transmission loss measurements.

7.1.11.2 *Result*—A way of identifying if a sound transmission laboratory can be considered equivalent to those who establish the original norm.

7.1.11.3 *Summary*—Details of how to build, install and measure the sound transmission loss of a steel reference specimen are provided. A table showing the mean and standard deviations of a round robin is provided for comparison. If a laboratory differs by more than two standard deviations at any one third octave band, the reasons for the difference should be sought and the appropriate modifications made.

7.1.12 *Classification E 1332—Classification for Determination of Outdoor-Indoor Transmission Class*:

7.1.12.1 *Use*—Provides a single-number rating to be used to compare building facade designs, including walls, doors,