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Standards on Noise Measurements, Rating Schemes, and Definitions: A Compilation

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[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

[2] Located at Boulder, Colorado 80302.

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Abstract

This compilation deals with material assembled from the various standards, industrial and trade organizations, or technical and scientific societies concerned with acoustics. There has been no attempt to review or evaluate the standards, but rather just to list documents covering measurement techniques, calibration methods, definitions, rating schemes, and equipment and product specifications concerned with noise. Those standards dealing solely with ultrasonics, audio equipment, or shock and vibration have not generally been included. The paragraphs describing the standards give a brief summary of intent and/or scope of the standard. In some cases the paragraph is the official description of the standard as issued by the organization or society promulgating the standard, while in others the paragraph merely describes the intent of the standard. Proposed standards are also listed where available. Not listed are proposed revisions of current standards and those which must be reapproved to remain in effect. For the convenience of those readers wishing to purchase copies of standards, names and addresses for the various organizations and/or societies are provided. Federal Regulations directly involving noise measurements are given in Appendix A. Appendix B lists active committees for each organization and names and addresses of appropriate committee chairmen or technical contacts. This compilation includes all information available as of January 1, 1976.

Key Words: Acoustics; noise; rating scheme; sound; standards organization.

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Preface

The existence of satisfactory standards and mechanisms for generating them are essential for the appropriate use of a country's technology in its commercial products and industrial processes. Standards deal with techniques for physical measurements, descriptive terminology, methods of test and agreements on dimensions, design, performance and physical characteristics dealing with products that are manufactured and sold. These latter standards are referred to as engineering or industrial standards which usually include more specific types of standards such as product standards, commercial standards and safety standards. The majority of these standards are normally not a matter of law and most are developed in the private sector. Exceptions usually occur in areas of health and safety. The use of such standards is voluntary but their widespread acceptance can often give them considerable commercial importance. The Government does issue mandatory standards as exemplified by those in the areas of pollution control and abatement, fabric flammability, and toy safety. Widely accepted standards can become mandatory when incorporated into contracts, codes and regulations.

There have been a number of recent legislative actions that give impetus and a sense of urgency to the development of standards and measurement methods that are needed for the effective implementation of a national program on noise pollution abatement and control. While the laws which have been enacted rarely call specifically for new or improved measurement standards, regulations can be enforced most effectively when based upon a fair, equitable, and uniform measurement methodology.

As part of its response to the measurement needs created by the concern over noise, its abatement, and control, NBS has prepared this compilation. Standards dealing specifically with noise plus those which are clearly germane to noise measurements have been included. However, this document does not include all standards dealing in part with acoustics. For example, there has been no attempt to include safety standards which incorporate a noise test as one of the many required measurements.

Table of Contents

1. Acoustical and Board Products Association (ABPA)
[formerly Acoustical and Insulating Materials Association (AIMA)]

Purchase standards from:

Acoustical and Board Products Association
205 West Touhy Avenue
Park Ridge, IL 60068

1.1 Summary of Standards

1.1.1 AMA-1-II-1967. METHOD OF TEST. CEILING SOUND TRANSMISSION TEST BY TWO-ROOM METHOD.

This is a performance test for a configurational property of ceiling constructions, without explicit reference to the sound absorption coefficients or sound transmission loss of ceiling materials. In particular, performance is rendered independent of the total in-situ absorption contribution of the receiving-room ceiling under test conditions by normalizing results with respect to separate measurements specified herein, thereby focusing attention upon the relative energy transmission of the ceiling configuration without appeal to absorption coefficients. The method of test is designed to reflect field conditions of ceiling erection under laboratory conditions of measurement control, without necessary restriction to standardized classes of ceiling construction beyond convenience for material comparisons.

The method of test is intended primarily for ranking the sound isolation performance of suspended-ceiling configurations in a specific test environment, generalized only with respect to receiving room absorption toward the ultimate objective of relating ceiling rankings quantitatively to partition-test rankings under widely varying field situations.

1.1.2 AM SPEC. NO. 11. (1972) ACOUSTICAL ABSORBERS.

The purpose of this Standard is to establish a uniform set of practices for the testing of Unit Acoustical Absorbers "surface-type" which will supplement the requirements of the American Society for Testing and Materials Designation: C423-66, Standard Method of Test for SOUND ABSORPTION OF ACOUSTICAL MATERIALS IN REVERBERATION ROOMS, or its latest revision.

Unit Acoustical Absorbers "surface-type" are defined for the purpose of this standard as elements of acoustical material differing from other sound absorbing materials only in distribution during use.

2. Acoustical Society of America (ASA)

Purchase Standards from:

Back Numbers Dept., Dept. Std.
American Institute of Physics
335 East 45th Street
New York, NY 10017

2.1 Summary of Standards

2.1.1 ASA STD 1-1975 METHOD FOR THE MEASUREMENT OF REAL-EAR PROTECTION OF HEARING PROTECTORS AND PHYSICAL ATTENUATION OF EARMUFFS.

See ANSI S3.19-1974.

2.1.2 ASA STD 3-1975 TEST-SITE MEASUREMENT OF NOISE EMITTED BY ENGINE POWERED EQUIPMENT.

This Standard presents test-site measurement methods for determining the maximum noise emitted by motor vehicles, public conveyances, construction and industrial machinery, and residential and recreational devices powered by engines operating on petroleum-based fuels, coal, steam, electricity, or other source of energy. It strives for simplicity of measurement technique, with regard for realistic operation of the equipment being tested and for reproducibility of test results. The test methods are intended for application to certification testing by the manufacturer, conformance testing by community agencies, and survey testing for community noise intrusion. This Standard is not intended as a basis for enforcement purposes at any location other than a qualified test site.

Specifically recognized as sources of community noise and included for coverage by this document are: automobiles; trucks of all types; multipurpose or utility vehicles; motorcycles and motorscooters; buses and motor-coaches; all railbound vehicles; engine-powered mobile equipment intended for use in residential areas (e.g., lawnmowers, snow removers, chain saws, etc.); and engine-powered recreational equipment (e.g., motorboats, snowmobiles, etc.). Conventional full-scale aircraft are excluded from coverage, although guidelines for measuring noise from model aircraft, rotary-wing aircraft, and ground-effect machines (hovercraft) are included. The procedures are not limited to this listing of equipment and are applicable to other engine-powered equipment which can also be categorized as contributing to community noise.

It is not the intent of this Standard to specify maximum permissible sound levels for any equipment. It is, however, recommended that A-weighted sound levels, when measured in accordance with this Standard, be specified for these limits. The use of sound levels for specifying the noise of engine-powered equipment does not preclude detailed frequency analyses as may be required for noise control studies, provided that the sound level data are also reported.

2.1.3 ASA STD 4-1975 METHOD FOR RATING THE SOUND POWER SPECTRA OF SMALL STATIONARY NOISE SOURCES (ANSI S3.17-1975).

The purpose of this standard is to establish a uniform method for rating the noise of small stationary equipment using sound power spectrum. This standard applies to all equipment which is essentially stationary in nature and for which a sound power spectrum may be determined. It is designed for products used in and about homes, and includes equipment normally used in connection with the operation and maintenance of a home or business. This standard deals with the method for rating and reporting the noise of such equipment.

3. Air-Conditioning and Refrigeration Institute (ARI)

Purchase standards from:

Air-Conditioning and Refrigeration Institute
1815 North Fort Myer Drive
Arlington, VA 22209

3.1. Summary of Standards

3.1.1 ARI STANDARD 270 (1967) STANDARD FOR SOUND RATING OF OUTDOOR UNITARY EQUIPMENT.

ARI has produced this Standard in order to provide the industry and the public with a procedure for rating and evaluating the sound levels of outdoor unitary equipment. The rating numbers may be used to predict expected sound pressure levels in a specific acoustical environment at a given distance. A recommended procedure for accomplishing this will be described in a related ARI application standard.

In this Standard, the rating of equipment, as obtained at specified Standard Operating Conditions, is in the form of single numbers, designated as ARI Standard Sound Rating Numbers.

For a specific model of outdoor unitary equipment, an ARI Standard Sound Rating Number is developed from basic acoustic measurements made as prescribed in ASHRAE Standards 36-62* or 36A-63*, as applicable. These measured one-third octave band power levels are weighted to adjust for psychoacoustic sensitivity to frequency distribution and any discrete tones which may be present and then are converted to an ARI Standard Sound Rating Number.

3.1.2 ARI STANDARD 275 (1969) STANDARD FOR APPLICATION OF SOUND RATED OUTDOOR UNITARY EQUIPMENT.

This standard provides a method of predicting the sound level resulting from the operation of outdoor sections of unitary air-conditioning and heat pump equipment. A simple step-by-step procedure is given which uses a sound rating number for the equipment, and the distance to the point at which equipment noise is to be predicted. The nature of the surroundings and of the installation is also taken into account.

The sound rating number is adjusted for these installation factors to establish a sound level number (SLN) which is used in an alignment chart to predict, for a specific location, a tone-corrected sound level which is intended to be a predictor of annoyance due to the sound. The annoyance level can be calculated precisely in the manner specified in the Appendix, from one-third octave band sound pressure levels measured at the point in question. It may be estimated (normally within ± 4 dB) from measurements of the A-weighted sound level. If desired, the NC level of the sound may also be estimated from the alignment chart. The accuracy of the prediction is dependent upon other application variables; i.e., the directivity of the sound from the unit and, to some degree, the spectrum of the sound from the unit.

Examples are used to clarify the procedure and recommended practices are presented to guide the acoustic considerations of air-conditioning equipment installations.

This Standard shall not be used for determining the sound rating number of outdoor unitary equipment.

3.1.3 ARI STANDARD 443 (1970) STANDARD FOR SOUND RATING OF ROOM FAN-COIL AIR-CONDITIONERS.

ARI has produced this standard to fulfill a growing need for a reliable method of sound rating room fan-coil air-conditioners.

This Method of rating is based upon tests conducted in accordance with ASHRAE Standard 36-62*, which gives test results for sound power levels. The acoustic output can best be defined by sound power levels, since these quantities are independent of the many environments in which the equipment may be used. Sound power levels may be used to predict the sound pressure levels that will result in a space of known acoustical characteristics.

It is recognized that room fan-coil air-conditioners and most other air-conditioning equipment produce complex sound spectra which may not be suitably rated from broad band measurements alone. The annoyance of pure tones, for example, is not reflected in octave band measurements. Consequently, this Standard requires measurements by one-third octave bands and applies subjective corrections based on extensive research in order to arrive at meaningful ratings.

3.1.4 ARI STANDARD 446 (1968) STANDARDS FOR SOUND RATING OF ROOM AIR-INDUCTION UNITS.

ARI has produced this Standard to fulfill a growing need for a reliable method of sound rating room air-induction units.

The relationship between this Standard and ASHRAE 36B-63* is analogous to the relationship between ARI 443 and ASHRAE 36-62*.

It should also be recognized that the sound power levels of room air-induction units will vary as functions of both the primary air quantity and the damper pressure drop. Therefore, the Standard Rating Conditions of this Standard include a specified damper pressure drop.

3.1.5 ARI STANDARD 575 (1973) STANDARD FOR METHOD OF MEASURING MACHINERY SOUND WITHIN EQUIPMENT ROOMS.

The purpose of this standard is to establish a uniform method of measuring, recording and specifying the sound pressure level of machinery installed in mechanical equipment spaces.

This standard applies to water chilling systems, pumps, and similar operating machines and parts thereof, which for reasons of size or operating problems cannot practically be evaluated by the procedures of ASHRAE Standard Methods of Testing for Sound Rating Heating, Refrigerating and Air-Conditioning Equipment (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Standard 36-72).

*Several of these Standards reference ASHRAE Standards 36-62, 36A-63 and 36B-63 which have been superseded by ASHRAE Standard 36-72, Methods of Testing for Sound Rating Heating, Refrigerating and Air-Conditioning Equipment.

4. Air Diffusion Council (ADC)

Purchase standards from:

Air Diffusion Council
435 North Michigan
Chicago, IL 60611

4.1. Summary of Standards

4.1.1 ADC 1062R3 (1972) EQUIPMENT TEST CODE (REPLACES 1062R2).

This Test Code is intended to provide a means for testing and rating air distribution and control devices. It should provide a basis for comparison among the available equipment and also for determining the comfort conditions of occupied rooms in air conditioning, heating and ventilating systems.

The purpose of this Test Code is to present in a single document all those techniques and facilities required for the measurement of performance of air distribution or air terminal devices. Methods of Test Measurement have been established to provide uniform test procedures, equipment and instrumentation with regard to air flow, velocity and pressure, temperature and sound generation. The sound measuring instrumentation and tests for determining the sound generated are in accordance with ANSI and ASHRAE Standards.

4.1.2 AD-63 (1963) MEASUREMENT OF ROOM-TO-ROOM SOUND TRANSMISSION THROUGH PLENUM AIR SYSTEMS.

The purpose of the measurements covered by this Standard is to determine the sound transmission along a complex path, the incident side or area of which is an opening (which may be fitted with a grille or similar device), the transmitting side or area of which is an identical opening, the intervening element of which is a ceiling plenum whose characteristics are hereinafter described. Such paths are commonly used for unducted air handling systems in buildings.

4.1.3 FD-72 (1972) FLEXIBLE AIR DUCT TEST CODE.

This standard establishes the requirements for the determination and presentation of air friction loss, leakage, and sound data for flexible air ducting used as a means of conveying conditioned air in heating and air conditioning systems. Requirements are established for the selection and preparation of test specimens, the test equipment and procedures to be used, the installation of test specimens, the accumulation of test data, and the format for presentation of results.

5. Air Moving and Conditioning Association (AMCA)

Purchase standards from:

Air Moving and Conditioning Association
30 West University Drive
Arlington Heights, IL 60004

5.1. Summary of Standards

5.1.1 AMCA STANDARD 300-67 TEST CODE FOR SOUND RATING.

This Code establishes a practical method of determining the sound power level of an Air Moving Device (AMD). The Code will: (a) Present values that are useful in field applications. (b) Give uniformly reproducible results in all qualified laboratories. (c) Be "practical" in the sense that its accuracy will be satisfactory for all general applications while its operation will not add significantly to the cost of the product.

These aims are achieved by applying standard, readily available sound measuring instruments to reverberant or semi-reverberant room with minimal restrictions on size and construction. The test set-ups are designed to represent general usage of the AMDs tested.

5.1.2 AMCA BULLETIN 301 (1965) STANDARD METHOD OF PUBLISHING SOUND RATINGS FOR AIR MOVING DEVICES.

This document establishes a standard method of publishing Sound Ratings for Air Moving Devices. The purpose of this Standard is to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for his particular need.

This Standard applies to: (a) Centrifugal Fans. (b) Axial and Propeller Fans. (c) Power Roof and Wall Ventilators. (d) Steam and Hot Water Unit Heaters. It is intended that this Standard shall also apply to Central Station Heating, Ventilating and Air Conditioning Units.

5.1.3 AMCA BULLETIN 302 (1965) APPLICATION OF SONE LOUDNESS RATINGS FOR NONDUCTED AIR MOVING DEVICES.

The AMCA method of rating in sones gives the loudness at a distance of 5 feet from the unit in free space with no nearby reflecting surfaces. Since most practical problems will involve the judgment of loudness within a room, some method is needed to relate the loudness in a given room to the "loudness rating" of the fan.

The charts and formulae given in this bulletin are for the purpose of determining the loudness of fans as installed, and take into consideration the room size and acoustical qualities as well as the number and ratings of the fans. Within the range of 3.5 and 38 sones, these charts are mathematically rigorous, and are sufficiently accurate for engineering applications from 1.5 to 85 sones. For the addition of sounds, it is assumed that the noise spectrums are similar. The room effect chart is for the reverberant field in the room, and applies everywhere except in the space very near to the fan.

5.1.4 AMCA PUBLICATION 303 (1965) APPLICATION OF SOUND POWER RATINGS FOR DUCTED AIR MOVING DEVICES.

AMCA Sound Power Level Ratings are indicators of the sound generated by an Air Moving Device when operated at various points within its normal operating range. The ratings are obtained from tests conducted by the method described in AMCA Standard 300, Test Code for Sound Rating AMDs, and are published in accordance with AMCA Standard 301, Method of Publishing Sound Ratings for AMDs.

Air Moving Devices that are normally used without ducts are rated in sones. Information on the use of sone ratings is given in AMCA Publication 302, Application of Sone Loudness Ratings.

5.1.5 AMCA PUBLICATION 311-67 CERTIFIED SOUND RATINGS PROGRAM FOR AIR MOVING DEVICES.

The purpose of the Certified Sound Ratings Program is to give the buyer, specifier, and user of air moving equipment increased assurance that published sound ratings are reliable. At the same time, the Program establishes standard testing and rating methods and assures the manufacturer that competitive ratings have been checked by an impartial authority.

6. American Gear Manufacturers Association (AGMA)

Purchase standards from:

American Gear Manufacturers Association
1330 Massachusetts Avenue, N.W.
Washington, D. C. 20005

6.1. Summary of Standards

6.1.1 AGMA 295.03 (1968) SPECIFICATION FOR MEASUREMENT OF SOUND ON HIGH SPEED HELICAL AND HERRINGBONE GEAR UNITS.

This Standard applies to gear units which are within the scope of Standard AGMA 421.06, "Standard Practice for High Speed Helical and Herringbone Gear Units", and as produced by the AGMA High Speed Units Manufacturer's Group. It does not include marine propulsion, aerospace, or automotive gearing. The specifications and procedures apply to sound measurement, testing methods, and limiting values of direct air-borne sound generated by a gear unit, and the auxiliary equipment required for its operation, whose prime mover is not integral with the unit.

Sound level characteristics of a gear unit are affected by types of foundations and room surroundings. Therefore, it should be understood that shop tests may not fully determine the level of sound in the installed locations.

6.1.2 AGMA 297.01 (1973) SOUND FOR ENCLOSED HELICAL, HERRINGBONE AND SPIRAL LEVEL GEAR DRIVES.

The purpose of this standard is to present the instrumentation and procedure to be used for sound measurements of enclosed helical, herringbone and spiral bevel gear drives as well as to present typical maximum sound levels (A-weighted sound pressure levels). This standard is limited to enclosed speed reducing or increasing gear drives designed and rated in accordance with Standard AGMA 420.04, "Practice for Enclosed Speed Reducers or Increasers Using Spur, Helical, Herringbone and Spiral Bevel Gears" and is limited to gears operating at a maximum pitch line-velocity of 5000 fpm and a maximum speed of 3600 rpm. This standard includes the instrumentation and procedure necessary for the determination of the gear unit sound level or octave-band sound pressure levels.

6.1.3 AGMA 298.01 (1975) SOUND FOR GEARMOTORS AND IN-LINE REDUCERS AND INCREASERS.

The purpose of this standard is to present the instrumentation and procedure to be used for sound measurements of gearmotors and in-line reducers and increasers as well as to present typical maximum sound levels (A-weighted sound pressure levels).

7. American National Standards Institute (ANSI)

Purchase standards from:

American National Standards Institute
1430 Broadway
New York, NY 10018

7.1. Summary of Standards

7.1.1 ANSI S1.1-1960 (R1971) AMERICAN NATIONAL STANDARD ACOUSTICAL TERMINOLOGY.

The purpose of this Standard is to establish standard acoustical terminology.

7.1.2 ANSI S1.2-1962 (R1971) AMERICAN NATIONAL STANDARD METHOD FOR THE PHYSICAL MEASUREMENT OF SOUND (PARTIALLY REVISED BY S1.13-1971 AND BY S1.21-1972).

This Standard applies primarily to airborne sound produced by apparatus which normally operates in air. These sounds must be nonimpulsive and of sufficient duration to be within the dynamic measuring capabilities of the instruments used. It applies primarily to apparatus which radiates sound as a by-product of its primary function. However, the general principles apply also to other sources of sound.

7.1.3 ANSI S1.4-1971 AMERICAN NATIONAL SPECIFICATION FOR SOUND LEVEL METERS.

The sound level meter is intended to be equally sensitive to sounds arriving at various angles, and to provide an accurate measurement of sound level with certain weightings for sound within stated ranges and with an indicating instrument that has standardized characteristics. The basic calibration of the sound level meter is given in terms of a random-incidence acoustic field of known properties.

It is recognized that various degrees of precision and accuracy are required in the practical measurement of sounds of various kinds for different purposes. Hence, this Standard provides the minimum requirements for three basic types of sound level meters: Types 1, 2, and 3, with performance requirements that become progressively less stringent, preceeding from Type 1 to Type 3. Further, it is recognized that sound level meters may be desired for special purposes that do not require the complexity of any of the three basic types. Therefore, provision is made for a special purpose sound level meter, Type S. The Type S meter can be qualified to the performance of any of the basic types (1, 2, 3) but is not required to have all three weighting networks.

7.1.4 ANSI S1.5-1963 (R1971) AMERICAN NATIONAL STANDARD RECOMMENDED PRACTICES FOR LOUD-SPEAKER MEASUREMENTS. (IEEE 219-1961).

These recommended practices, taken from the 1961 version of IEEE 219, define terms associated with loudspeakers and their testing, recommend various methods of testing, and indicate preferred methods of presenting information regarding their characteristics.

7.1.5 ANSI S1.6-1967 (R1971) AMERICAN NATIONAL STANDARD PREFERRED FREQUENCIES AND BAND NUMBERS FOR ACOUSTICAL MEASUREMENTS. (Agrees with ISO 266-1975.)

For certain acoustical measurements a constant-frequency increment is a suitable spacing. More commonly, however, a constant-percentage increment is adopted and the test frequencies then form a geometric series. This Standard deals with the geometric series. The present Standard is not concerned with frequencies for music.

7.1.6 ANSI S1.7-1970 SOUND ABSORPTION OF ACOUSTICAL MATERIALS IN REVERBERATION ROOMS, METHOD OF TEST FOR.

See ASTM C423-66.

7.1.7 ANSI S1.8-1969 AMERICAN NATIONAL STANDARD PREFERRED REFERENCE QUANTITIES FOR ACOUSTICAL LEVELS.

This Standard is concerned with the reference quantities for, and definitions of, some levels for acoustics, electroacoustics, and mechanical vibrations. It applies to oscillatory quantities. The use of levels is not made mandatory by this Standard. It simply provides standard reference quantities for use when, and if, levels are employed for reasons beyond the scope of the Standard. Reference quantities are stated in units of the International System (Systeme International S1), and also in centimeter-gram-second (cgs) and British units. The reference quantities are, however, applicable regardless of the system of units employed.

Certain symbols and abbreviations not already standardized were needed, and have been employed here simply for illustrative purposes. The present Standard is intended to encourage uniformity of practice by specifying a definition for a level likely to be employed in acoustics. The purpose of this Standard is to provide a preferred reference quantity of convenient magnitude for a given kind of acoustical level.

7.1.8 ANSI S1.10-1966 (R1971) AMERICAN NATIONAL STANDARD METHODS FOR THE CALIBRATION OF MICROPHONES.

In this Standard, methods are described for performing absolute and comparison calibrations of laboratory standard microphones specified in American Standard Specification for Laboratory Standard Pressure Microphones, Z24.8-1949. Absolute calibration is based upon the reciprocity principle. Techniques for performing pressure (coupler), free-field, and random-field calibrations are described, including experimental procedures. The free-field and random-field calibration techniques may also be used for calibrating microphones not described in American Standard Z24.8-1949.

(Note: Also see IEC 327 (1971)).

7.1.9 ANSI S1.11-1966 (R1971) AMERICAN NATIONAL STANDARD SPECIFICATION FOR OCTAVE, HALF-OCTAVE, AND THIRD-OCTAVE BAND FILTER SETS.

The purpose of this standard for filter sets is to specify particular bandwidths and characteristics which may be used to ensure that all analyses of noise will be consistent within known tolerances when made with similar filter sets meeting these specifications. It is suited to the requirements for analyzing, as a function of frequency, a broadband electrical signal. For acoustical measurements an electro-acoustic-transducer and amplifier are employed to convert the acoustic signal to be analyzed into the required electrical signal.

(Note: Also see IEC 225 (1966))

7.1.10 ANSI S1.12-1967 (R1972) AMERICAN NATIONAL STANDARD SPECIFICATIONS FOR LABORATORY STANDARD MICROPHONES.

This Standard describes types of laboratory microphones that are suitable for calibration by an absolute method such as the reciprocity technique described in U.S. Standard Method for the Calibration of Microphones, S1.10-1966. These microphones are intended for use as acoustical measurement standards either in a free-field or in conjunction with a variety of devices such as artificial voices and couplers for calibrating earphones or microphones.

7.1.11 ANSI S1.13-1971 AMERICAN NATIONAL STANDARD METHODS FOR THE MEASUREMENT OF SOUND PRESSURE LEVELS. (Partial revision of S1.2-1962).

The purpose of this Standard is to provide uniform guidelines for measuring and reporting sound-pressure levels observed under different environmental conditions. This Standard is applicable to the many different types of sound-pressure levels observed under different environmental conditions. This Standard is applicable to the many different types of sound-pressure-level measurements commonly encountered in practice. This Standard is intended to assist in the preparation of test codes for (1) determining compliance with a specification, ordinance, or acoustical criterion, and (2) obtaining information to assess the effects of noise on people or equipment.

7.1.12 ANSI S1.21-1972 AMERICAN NATIONAL STANDARD METHODS FOR THE DETERMINATION OF SOUND POWER LEVELS OF SMALL SOURCES IN REVERBERATION ROOMS. (Revision of Section 3.5 of S1.2-1962.)

This Standard describes a direct method and a comparison method for determining the sound power level produced by a source. This Standard contains test room requirements, source locations and operating conditions, instrumentation, and techniques for obtaining an estimate of the mean-square sound pressure from which the sound power level of the source in octave or one-third octave bands is calculated. It is intended to provide techniques for acoustical measurements that can be used in test codes for particular types of equipment. This Standard applies primarily to the measurement of sound that is uniformly distributed in frequency over the frequency range of interest and is relatively steady for at least 30 sec. The spectrum of the sound may, however, also include prominent discrete-frequency components or narrow bands.

7.1.13 ANSI S3.1-1960 (R1971) AMERICAN NATIONAL STANDARD CRITERIA FOR BACKGROUND NOISE IN AUDIOMETER ROOMS.

This Standard specifies the maximum ambient sound-pressure levels in an audiometer room that will produce negligible masking of tones presented at normal threshold pressures specified in American National Standard Audiometers for General Diagnostic Purposes, Z24.5-1951, and American National Standard Specification for Pure-Tone Audiometers for Screening Purposes, Z24.12-1952.

This Standard pertains to earphone listening and pure-tone audiometry. Cushions and earphones not described in American Standards Z24.5-1951 and Z24.12-1952 are specifically excluded.

(Note: ANSI Z24.5-1951 and ANSI Z24.12-1952 have been replaced by ANSI S3.6-1969.)

7.1.14 ANSI S3.2-1960 (R1971) AMERICAN NATIONAL STANDARD METHOD FOR MEASUREMENT OF MONOSYLLABIC WORD INTELLIGIBILITY.

This Standard describes the procedures to be followed in conducting intelligibility tests which employ monosyllabic word lists.

The purpose of this Standard is (1) to specify the speech material and the methods to be used in these tests, and (2) to note the variables to be controlled during the measurement and to be evaluated in the report.

7.1.15 ANSI S3.3-1960 (R1971) AMERICAN NATIONAL STANDARD METHODS FOR MEASUREMENT OF ELECTROACOUSTICAL CHARACTERISTICS OF HEARING AIDS.

The purpose of this Standard is to describe practicable and reproducible methods of determining certain physical performance characteristics of air-conduction hearing aids that use electronic amplification and acoustic coupling to ear canal by means of ear inserts, e.g., ear molds or similar devices. This Standard does not apply when automatic gain control is in use. The

acoustical test procedure is based on the free-field technique, in which the hearing aid is placed in a plane progressive wave with the earphone coupled to a standardized coupler. The results obtained by the methods specified herein express the performance under the conditions of the test, but will not necessarily agree exactly with the performance of the hearing aid under practical conditions of use. For this reason, the difference between practical and test conditions must be borne in mind in interpreting the test results.

(Note: Also see IEC 118 (1959).)

7.1.16 ANSI S3.4-1968 (R1972) AMERICAN NATIONAL STANDARD PROCEDURE FOR THE COMPUTATION OF LOUDNESS OF NOISE.

This Standard specifies a procedure for calculating the loudness experienced by a typical listener under the following conditions:

Diffuse Field. The sound is assumed to reach the listener's ears from essentially all directions. This condition is approximated in an ordinary room.

Spectrum. The procedure is designed specifically for noise with broad-band spectra. Errors may arise if it is applied to noises with sharp line spectral components, e.g., fan-blade noise.

Steady State. The procedure is designed for noises that are steady state rather than intermittent. Application to certain types of intermittent sounds, e.g., impact sounds and speech, may lead to discrepancies between measured and calculated loudness levels. The magnitude of the discrepancy will be related to the dynamic characteristics of the sound level meter used to determine the sound-pressure levels.

7.1.17 ANSI S3.5-1969 AMERICAN NATIONAL STANDARD METHODS FOR THE CALCULATION OF THE ARTICULATION INDEX.

Methods have been developed for computing a physical measure that is highly correlated with the intelligibility of speech as evaluated by speech preception tests administered to a given group of talkers and listeners. This measure is called the Articulation Index, AI. The AI is a weighted fraction representing, for a given speech channel and noise condition, the effective proportion of the normal speech signal that is available to a listener for conveying speech intelligibility. AI is computed from acoustical measurements or estimates of the speech spectrum and of the effective masking spectrum of any noise which may be present along with the speech at the ear of a listener.

The method described in this Standard is designed for and has been principally validated against intelligibility tests involving adult male talkers. The method cannot, therefore, be assumed to apply to situations involving female talkers or children. The purpose of this Standard is to prescribe procedures for computing an AI and to provide functions relating to AI and speech intelligibility scores obtained with male talkers.

7.1.18 ANSI S3.6-1969 AMERICAN NATIONAL STANDARD SPECIFICATIONS FOR AUDIOMETERS. (Replaces ANSI Z24.5-1951, Z24.12-1952, and Z24.13-1953.)

The audiometers covered by this specification are devices designed for use in determining the hearing threshold level of an individual in comparison with a chosen standard reference threshold level, primarily for the purpose of identification of hearing deficiencies of the individual.

7.1.19 ANSI S3.7-1973 COUPLER CALIBRATION OF EARPHONES, METHOD FOR. (REVISION AND REDESIGNATION OF Z24.9-1949).

This standard specifies and describes earphone couplers that are in current use, together with their capabilities and limitations, and presents methods for the coupler calibration of earphones. Most of these methods are applicable to

precision point-by-point determination or to automatic data recording.

The purpose of coupler calibration of earphones is to provide a simple, convenient, and reproducible means of determining their acoustical output. Each of the couplers described in this standard has been designed for use with a specific class of earphone. When so used, the couplers have acoustic-input impedances which, over a limited frequency range, are approximately equal to the corresponding impedances of the average human ear under the specified conditions. The couplers described in this standard are suitable for use with supra-aural (against-the-ear) and insert (ear-canal) type earphones.

7.1.20 ANSI S3.8-1967 (R1971). AMERICAN NATIONAL STANDARD METHOD OF EXPRESSING HEARING AID PERFORMANCE.

The purpose of this Standard is to provide a uniform method of numerically and graphically expressing certain fundamental performance characteristics of hearing aids in a simple manner, so that those using such data can be assured of their meaning.

All quantities to be specified in this Standard shall be based on measurements made in accordance with U. S. Standard Methods for Measurement of the Electroacoustical Characteristics of Hearing Aids, S3.3-1960.

7.1.21 ANSI S3.13-1972. AMERICAN NATIONAL STANDARD ARTIFICIAL HEAD-BONE FOR THE CALIBRATION OF AUDIOMETER BONE VIBRATORS.

The purpose of this Standard is to specify the mechanical impedance characteristic of an artificial headbone that would be incorporated into devices used in calibrating audiometer bone vibrators. The Standard also specifies the vibrator tip size and shape, as well as the static force of application for which the standardized mechanical impedance characteristics apply. The characteristics of an interim head-bone device presently used for audiometer bone-vibrator calibration are stated in Appendix A and corresponding interim reference threshold levels are given.

7.1.22 ANSI S3.17-1975 METHOD FOR RATING THE SOUND POWER SPECTRA OF SMALL STATIONARY NOISE SOURCES.

See ASA STD 4-1975.

7.1.23 ANSI S3.19-1974 MEASUREMENT OF REAL-EAR PROTECTION OF HEARING PROTECTORS AND PHYSICAL ATTENUATION OF EARMUFFS, METHOD FOR THE (REVISION AND REDESIGNATION OF Z24.22-1957) (ASA STD 1-1975).

This standard specifies the definitions, requirements, and procedures for the measurement of acoustical performance of personal hearing protection devices. It is a revision of American National Standard for the Measurement of the Real-Ear Attenuation of Ear Protectors at Thresholds, Z24.22-1957. The principal changes are the inclusion of a method for the measurement of physical attenuation of earmuff devices and the substitution of narrow bands of noise instead of discrete tones as the test stimuli. The physical measurement method is intended for production test and engineering design; it is not suitable for earplug testing. This standard is not appropriate to the evaluation of hearing-protective devices to operate exclusively against impulsive noise.

7.1.24 ANSI S3.20-1973 PSYCHOACOUSTICAL TERMINOLOGY.

This standard gives definitions of psychoacoustical terms.

7.1.25 ANSI S5.1-1971 MEASUREMENT OF SOUND FROM PNEUMATIC EQUIPMENT, TEST CODE FOR THE.

See Compressed Air and Gas Institute (CAGI) Test Code.

7.1.26 ANSI S6.1-1973 QUALIFYING A SOUND DATA ACQUISITION SYSTEM.

See SAE J184-1973.

7.1.27 ANSI S6.2-1973 EXTERIOR SOUND LEVEL FOR SNOWMOBILES.

See SAE J192a-1973.

7.1.28 ANSI S6.3-1973 SOUND LEVEL FOR PASSENGER CARS AND LIGHT TRUCKS.

See SAE J986a-1972.

7.1.29 ANSI S6.4-1973 COMPUTING THE EFFECTIVE PERCEIVED NOISE LEVEL FOR FLYOVER AIRCRAFT NOISE, DEFINITIONS AND PROCEDURES FOR.

See SAE ARP 1071-1973.

7.1.30 ANSI Y10.11-1953. AMERICAN NATIONAL STANDARD LETTER SYMBOLS FOR ACOUSTICS.

This Standard comprises letter symbols for use in acoustics.

7.1.31 ANSI Y32.18-1972. AMERICAN NATIONAL STANDARD SYMBOLS FOR MECHANICAL AND ACOUSTICAL ELEMENTS AS USED IN SCHEMATIC DIAGRAMS.

This document presents standard symbols and definitions that may be used in constructing schematic diagrams for mechanical and acoustical systems whose performances are describable by finite sets of scalar variables.

7.2. Draft Proposals for New Standards

7.2.1 ANSI S1.22 SCALES AND RATIOS FOR PLOTTING.

7.2.2 ANSI S1.23-197X METHOD FOR DESIGNATING THE SOUND POWER EMITTED BY MACHINERY AND EQUIPMENT.

7.2.3 REVISION OF ANSI S3.3-1960 (R1971) AND ANSI S3.8-1967 (R1971) INTO A SINGLE STANDARD, MEASUREMENT AND EXPRESSION OF HEARING AID PERFORMANCE.

7.2.4 SUPPLEMENT OR ADDENDUM TO ANSI S3.7-1973 ON CALIBRATION OF HEARING AID RECEIVERS ON A MODIFIED ZWISLOCKI-TYPE COUPLER.

7.2.5 ANSI S3.14 SPEECH INTERFERENCE.

7.2.6 ANSI S3.15 METHOD FOR MEASUREMENT OF COMMUNITY NOISE.

7.2.7 ANSI S3.16 HEARING CONSERVATION CRITERIA.

7.2.8 ANSI S3.21 PURE-TONE AUDIOMETRY.

7.2.9 ANSI S3.22 SPECIFICATION OF HEARING AID CHARACTERISTICS.

7.2.10 ANSI S10.1 THE MEASUREMENT OF SOUND EMITTED BY PORTABLE, STATIONARY AND FIXED ELECTRIC TOOLS.

7.2.11 ABSORPTION OF ANY SOUND BY THE ATMOSPHERE.

7.2.12 EVALUATION OF ABSORPTIVE WEDGES AND ANECHOIC CHAMBERS.

8. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

Purchase standards from:

American Society of Heating, Refrigerating, and
Air Conditioning Engineers
345 E. 47th Street
New York, NY 10017

8.1 Summary of Standards

8.1.1 ASHRAE 36-72 METHODS OF TESTING FOR SOUND RATING HEATING, REFRIGERATING, AND AIR-CONDITIONING EQUIPMENT (SUPERCEDES ASHRAE STANDARDS 36-62, 36A-63, and 36B-63).

This Standard establishes a method of testing heating, refrigerating and air-conditioning equipment to determine the sound power levels in frequency bands. It applies to heating, refrigerating and air-conditioning equipment, or portions of such equipment, that radiate sound directly either to a room or to the outdoors.

This test procedure determines in standardized frequency bands the sound power level output of mechanical equipment by a comparison between: (a) the space/time-averaged sound pressure established by the operation of the equipment in a suitably designed test room; and (b) the space/time-averaged sound pressure established in the same room by a stable reference sound source whose sound power output has been accurately calibrated independently. (This procedure is commonly called the "comparison method".)

8.1.2 ASHRAE 68-75 METHOD OF TESTING SOUND POWER RADIATED INTO DUCTS FROM AIR MOVING DEVICES.

This Standard describes a laboratory method of determining the sound power transmitted into ducts from air moving devices.

9. American Society for Testing and Materials (ASTM)

Purchase standards from:

American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

9.1. Summary of Standards

9.1.1 ASTM C384-58 (Reapproved 1972) STANDARD METHOD OF TEST FOR IMPEDANCE AND ABSORPTION OF ACOUSTICAL MATERIALS BY THE TUBE METHOD.

This method of test is limited to the use of apparatus consisting of a tube of uniform cross-section and fixed length, terminated by a specimen of acoustical material, excited by a single tone of selectable frequency, in which the standing wave pattern in front of the specimen upon which plane waves impinge at normal incidence in explored by means of a moving probe tube or microphone. This tube method provides absolute measurement of the normal incidence sound absorption coefficient and the specific normal acoustic impedance of a material. Normal incidence coefficients, as measured by this method, are considerably lower than random incidence values, which more closely represent the performance of the material in a room; and there is no simple, unique relation between the two values. Means of estimating random incidence values from the measured normal incidence data are given in Appendix I.

9.1.2 ASTM C423-66 (Reapproved 1972) STANDARD METHOD OF TEST FOR SOUND ABSORPTION OF ACOUSTICAL MATERIALS IN REVERBERATION ROOMS (ANSI S1.7-1970).

This method covers the measurement of the sound absorption of acoustical materials in a diffuse sound field. When a material is in the form of an extended plane surface, such as an acoustical ceiling or wall treatment, the results shall be given as sound absorption coefficients. When the materials are separate objects, such as theater chairs or unit sound absorbers, the results shall be given in sabins per unit with a description of the number and spacing of the units.

9.1.3 ASTM C634-73 STANDARD DEFINITIONS OF TERMS RELATING TO ACOUSTICAL TESTS OF BUILDING CONSTRUCTIONS AND MATERIALS.

This Standard lists the terms commonly associated with the acoustical tests of buildings. In some of the entries, those that are measures of physical quantities, the associated symbol dimensions and units are given.

9.1.4 ASTM C643-73 PAINTING CEILING MATERIALS FOR ACOUSTICAL ABSORPTION TESTS.

This method covers the painting of an acoustical ceiling material to determine the changes, if any, in its sound absorption coefficients when repainting is done for maintenance reasons. The specimen size and the procedure for the acoustical tests shall be as required by ASTM C423.

9.1.5 ASTM E90-75 STANDARD RECOMMENDED PRACTICE FOR LABORATORY MEASUREMENT OF AIRBORNE SOUND TRANSMISSION LOSS OF BUILDING PARTITIONS.

This Recommended Practice covers the laboratory measurement of airborne sound transmission loss of building partitions such as walls of all kinds, floor-ceiling assemblies, doors, and other space-dividing elements. The sound transmission loss is defined in terms of a diffuse incident sound field, and this is intrinsic to the test procedure. The results are most directly applicable to similar sound fields, but provide a useful general measure of performance of the variety of sound fields to which a partition may typically be exposed.

9.1.6 ASTM E336-71 STANDARD RECOMMENDED PRACTICE FOR MEASUREMENT OF AIRBORNE SOUND INSULATION IN BUILDINGS.

This Recommended Practice establishes uniform procedures for the determination of field transmission loss, that is, the airborne sound insulation provided by a partition already installed in a building. It also establishes, in Appendix A1, a standard method for the measurement of the noise reduction between two rooms in a building, that is, the difference in average sound pressure levels in the rooms on opposite sides of the test partition. Where the test structure is a complete enclosure out-of-doors, neither the field transmission loss nor the noise reduction is appropriate; instead, a method is established for determining the insertion loss, also in Appendix A1. This Recommended Practice gives measurement procedures for determining the field transmission loss in nearly all cases that may be encountered in the field; no limitation to room-to-room transmission is intended. Thus, several different test procedures are given, each suited to a specific type of measurement situation; the appropriate measurement procedure must be selected for each field test according to the type of situation which that particular case most closely resembles.

9.1.7 ASTM E413-73 STANDARD CLASSIFICATION FOR DETERMINATION OF SOUND TRANSMISSION CLASS.

The purpose of this Classification is to provide a single-figure rating that can be used for comparing partitions for general building design purposes. The rating is designed to correlate with subjective impressions of the sound insulation provided against the sounds of speech, radio, television, music and similar sources of noise in offices and dwellings. Excluded from the scope of this classification system are applications involving noise spectra that differ markedly from those described above. Thus excluded, for example, would be the noises produced by most machinery, certain industrial processes, bowling alleys, power transformers, and the like. A particular exclusion would be the exterior walls of buildings, for which noise problems are most likely to involve motor vehicles or aircraft. In all such problems it is best to use the detailed sound transmission loss values, in conjunction with actual spectra of intrusive and ambient noise.

9.1.8 ASTM E477-73 STANDARD METHOD OF TESTING DUCT LINER MATERIALS AND PREFABRICATED SILENCERS FOR ACOUSTICAL AND AIRFLOW PERFORMANCE.

This Method covers the laboratory testing of duct liner materials, integral ducts, and in-duct absorptive silencers used in the ventilation systems of buildings. Procedures are described for the measurement of acoustical insertion loss, airflow generated noise, and pressure drop as a function of airflow. Excluded from the scope are reactive mufflers and those designed for uses other than in ventilation systems, such as automobile mufflers.

9.1.9 ASTM E492-73T TENATIVE METHOD OF LABORATORY MEASUREMENT OF IMPACT SOUND TRANSMISSION THROUGH FLOOR CEILING ASSEMBLIES USING THE TAPPING MACHINE (1971).

This Method covers a laboratory method of measuring impact sound transmission of floor-ceiling assemblies, wherein it is assumed that the test specimen constitutes the primary sound transmission path into a receiving room located directly below and in which there exists a diffuse sound field. Measurements may be conducted on floor-ceiling assemblies of all kinds, including those with floating-floor or suspended ceiling elements, or both, and floor-ceiling assemblies surfaced with any type of floor-surfacing or floor-covering materials. This method further prescribes a uniform method of reporting laboratory test data, and a single-figure classification rating, "Impact Insulation Class, IIC" that can be used by architects, builders, and specification and code authorities for acoustical design purposes in building construction.

9.1.10 ASTM E497-73T TENATIVE RECOMMENDED PRACTICE FOR INSTALLATION OF FIXED PARTITIONS OF LIGHT FRAME TYPE FOR THE PURPOSE OF CONSERVING THEIR SOUND INSULATION EFFICIENCY.

This Recommended Practice covers measures intended to prevent situations or conditions that will detract from the sound-insulating properties of acoustically-rated walls of the light frame type. It is not intended to include all sound insulating constructions. Many acoustically-rated partitions are also fire rated and when being installed must be built in accordance with the construction details specified in the fire test construction. In any event, applicable building codes and regulations should be checked for possible conflicts.

Fixed partitions of light frame type are interior (load bearing or non-load bearing) walls of wood or metal frame construction weighing less than 20 lb/ft^2 (98 kg/m^2) when assembled, exclusive of doors and windows. They are designed to remain in place for the normal lifespan of the building. Fixed partitions of light frame type do not include those of cast concrete, precast concrete, concrete masonry blocks, gypsum blocks, clay tile blocks, or other similar heavy construction.

Excluded from this scope are operable and demountable partitions. Operable are those partitions which are instantly movable. Demountable partitions are those which are designed and installed with the intent of later being taken down and re-erected by a crew over a period of time, with the components being reusable. Plumbing wall and kitchen problems are excluded from this document.

9.1.11 ASTM E557-75 STANDARD RECOMMENDED PRACTICE FOR THE ARCHITECTURAL APPLICATION AND INSTALLATION OF OPERABLE PARTITIONS.

This Standard describes practices to be followed in preparation for application and installation of operable partitions and, to some extent, in the design of the building in which they are installed.

9.2. Draft Proposals for New Standards

9.2.1 FIELD SOUND ISOLATION TEST.

9.2.2 METHOD FOR LABORATORY MEASUREMENT OF THE NOISE REDUCTION OF SOUND ISOLATING ENCLOSURES.

9.2.3 METHOD OF TEST FOR SOUND REFLECTION OF OPEN-PLAN CEILING ASSEMBLIES.

9.2.4 METHOD OF TEST FOR AIRBORNE SOUND INSULATION BETWEEN ROOMS SHARING A COMMON CEILING AND PLENUM.

9.2.5 ALTERNATE IMPACT TEST METHOD USING A MODIFIED TAPPING MACHINE.

10. American Textile Machinery Association (ATMA)

Purchase standards from:

American Textile Machinery Association
1730 M St. N.W.
Washington, D. C. 20036

10.1 Summary of Standards

10.1.1 ATMA TEST PROCEDURE (1973) NOISE MEASUREMENT TECHNIQUE FOR TEXTILE MACHINERY.

This Noise Measurement Technique is designed for application to textile machinery as defined in the procedure, except where other recognized industry standards have been issued prior to issuance of this Technique.

The purpose of this Technique is to provide a uniform basis for measuring and communicating machinery noise information between textile machinery manufacturers and textile manufacturers.

11. Anti-Friction Bearing Manufacturers Association (AFBMA)

Purchase standards from:

Anti-Friction Bearing Manufacturers Association
60 East 42nd Street
New York, NY 10017

11.1 Summary of Standards

11.1.1 AFBMA STANDARD NO. 13 (1968) ROLLING BEARING VIBRATION AND NOISE.

Under certain operating conditions, vibration in rotating rolling bearings can be of importance as an operating characteristic of such bearings. For this reason, the measurement of vibration emitted by a rolling bearing under specified test conditions is utilized for study and qualification as one facet of quality assurance.

This standard on rolling bearing noise and vibration serves to define and specify, for purposes of bearing quality assurance, the physical quantities measured and the test conditions utilized in measurement of vibration and noise generated by rolling bearings. Based on the standard, parties to the acceptance inspection of rolling bearings may, by agreement, establish acceptance specifications and grades of rolling bearings with which to control bearing vibration and noise.

In the current edition of this Standard, only selected methods for the measurement of the (structure-borne) vibration of certain types of ball bearings have been specified. Other vibration measurement methods, as well as methods for the measurement of rolling bearing (air-borne) noise, may be specified in later editions.

12. Association of Home Appliance Manufacturers (AHAM)

Purchase standards from:

Association of Home Appliance Manufacturers
20 North Wacker Drive
Chicago, IL 60606

12.1 Summary of Standards

12.1.1 AHAM RAC-2SR (1971) ROOM AIR CONDITIONER SOUND RATING.

The standard establishes uniform testing conditions. The sound rating of room air conditioners shall be based upon tests made in accordance with ASHRAE Standards 36A-63, Method of Determining Sound Power Levels of Room Air Conditioners and Other Ductless, Through-the-Wall Equipment in test rooms qualified for pure tone response in accordance with Appendix I of this Standard in the one-third octave bands having center frequencies from 100 thru 10,000 Hz, inclusive. Temperature conditions, electrical input, and position of dampers, grilles, and controls shall be maintained continuously for a minimum of one hour before sound measurements are taken to ensure that a stabilized condition has been reached.

(Note: ASHRAE Standard 36A-63 has since been superceded by ASHRAE Standard 36-72, Methods of Testing for Sound Rating Heating, Refrigerating, and Air-Conditioning Equipment.)

12.2. Draft Proposals for New Standards

12.2.1 ROOM AIR CONDITIONER SOUND APPLICATION STANDARD.

13. Compressed Air and Gas Institute (CAGI)

Purchase standards from:

Compressed Air and Gas Institute
2130 Keith Building
Cleveland, OH 44115

13.1. Summary of Standards

13.1.1 CAGI TEST CODE (1969) CAGI-PNEUROP TEST CODE FOR THE MEASUREMENT OF SOUND FROM PNEUMATIC EQUIPMENT (ANSI S5.1-1971).

The purpose of the Code is to provide standard test procedures for the measurement of airborne sound from pneumatic equipment. This code applies to compressors and pneumatic equipment and specifies procedures and operating conditions acceptable and expedient for use by non-specialists as well as by acoustical engineers.

14. Diesel Engine Manufacturers Association (DEMA)

Purchase standards from:

Diesel Engine Manufacturers Association
2130 Keith Building
Cleveland, OH 44115

14.1. Summary of Standards

14.1.1 DEMA TEST CODE (1972) FOR THE MEASUREMENT OF SOUND FROM HEAVY-DUTY RECIPROCATING ENGINES.

The purpose of this document is to establish a standard procedure for measuring, recording, and reporting data in acoustic surveys at engine installations. Section 5.0 deals with noise levels inside the building. Section 6.0 deals with noise levels outside the building, particularly on plant boundaries.

This Code applies to heavy-duty internal combustion engines and driven equipment, such as generators, pumps or compressors and specifies procedures and operating conditions acceptable and expedient for use by non-specialists as well as by acoustic engineers.

15. Electronic Industries Association (EIA)

Purchase standards from:

Electronic Industries Association
2001 Eye Street, N.W.
Washington, D. C. 20006

15.1. Summary of Standards

15.1.1 EIA RS-426 (1975) LOUDSPEAKERS, POWER RATING, SINGLE VOICE COIL.

This test measures the loudspeaker's ability to provide long service with rated maximum input power. This test may be used as a life test. Two causes of failure are: thermal, due to overheating the voice coil, and mechanical, due to fatigue of some part. "Program Noise" approximates normal program material for these tests.

16. Federal Construction Guide Specification (FCGS)

Purchase standards from:

General Services Administration
Public Building Service
Office of Construction Management
Criteria and Research Branch
19th and F Street, N.W.
Washington, D.C. 20405

16.1. Summary of Standards

16.1.1 FCGS 09500 (1972) ACOUSTICAL TREATMENT.

This specification gives general guidelines for the preparation and/or use of construction specifications by federal agencies. Its use is voluntary.

16.1.2 FCGS 15140 (1972) VIBRATION ISOLATION AND SOUND CRITERIA FOR EQUIPMENT.

See PBS: 4-1515-71.

17. Federal Specifications

Purchase standards from:

Specification Sales (3FRDS)
Building 197, Washington Navy Yard
General Services Administration
Washington, D.C. 20407

also at other General Services Administration
Business Service Centers

17.1. Summary of Standards

17.1.1 SS-S-111a AND AMENDMENT-1 (1968) SOUND CONTROLLING MATERIALS (TROWEL AND SPRAY APPLICATIONS).

This specification covers acoustical materials for trowel or spray application.

17.1.2 SS-S-118a (3) (1972) SOUND CONTROLLING BLOCKS AND BOARDS (ACOUSTICAL TILES AND PANELS, PREFABRICATED).

This specification covers prefabricated acoustical tiles and panels (blocks and boards) which provide acoustical treatment and interior finish.

17.1.3 FEDERAL SPECIFICATION HH-I-545B INSULATION, THERMAL AND ACOUSTICAL (MINERAL FIBER, DUCT LINING MATERIAL) (1971).

This specification covers mineral fiber insulation for lining the interior surfaces of ducts, plenums, and other airhandling equipment, and to provide sound attenuation in systems that handle air up to 250°F.

18. Home Ventilating Institute (HVI)

Purchase standards from:

Home Ventilating Institute
230 North Michigan Ave.
Chicago, IL 60601

18.1. Summary of Standards

18.1.1 HVI SOUND TEST PROCEDURE (1974).

The general purpose of the HVI Report is to provide a laboratory procedure for the taking of measurements of the sound output of home ventilating equipment and to establish a method for the interpretation and/or presentation of the data obtained.

19. Industrial Silencer Manufacturers Association (ISMA)

Purchase standards from:

R. J. Yeager, ISMA
c/o Burgess Industries
P. O. Box 47146
Dallas, TX 75247

19.1. Summary of Standards

19.1.1 ISMA TEST PROCEDURE (1974). STANDARD LABORATORY TEST PROCEDURE FOR INSERTION LOSS MEASUREMENT OF INTAKE AND EXHAUST SILENCERS FOR RECIPROCATING ENGINES.

This procedure covers dynamic insertion loss measurement under controlled laboratory conditions on reciprocating engine intake and exhaust silencers. Silencer pressure drop test procedure is covered by reference only. Standard methods of interpolation and extrapolation of test data to cover other size silencers is included.

19.1.2 ISMA TEST PROCEDURE (1974). FIELD TEST PROCEDURE FOR THE MEASUREMENT OF SILENCED SOUND LEAKS AND/OR UNSILENCED SOUND LEVELS AND INSERTION LOSS, OF RECIPROCATING ENGINE INTAKE AND EXHAUST SYSTEMS.

This procedure covers dynamic silenced, unsilenced and insertion loss measurements of reciprocating engine intake and exhaust systems in the field. All tests will be run with the engine at full load unless specifications covering the silencer acoustical performance prescribe other operating conditions.

19.2. Draft Proposals for New Standards

19.2.1 INSERTION LOSS OF SILENCERS FOR POSITIVE DISPLACEMENT COMPRESSORS AND BLOWERS.

19.2.2 INSERTION LOSS OF SILENCERS FOR CENTRIFUGAL COMPRESSORS AND BLOWERS.

19.2.3 INSERTION LOSS OF VENT SILENCERS.

19.2.4 INSERTION LOSS OF PRESSURE REDUCTION AND REGULATOR VALVE SILENCERS.

19.2.5 INDUSTRIAL SILENCER RATING TECHNIQUES FOR NOISE.

20. Institute of Electrical and Electronic Engineers (IEEE)

Purchase standards from:

Institute of Electrical and Electronic Engineers
445 Hoes Lane
Piscataway, NJ 08854

20.1. Summary of Standards

20.1.1 IEEE STD. 85-1973 IEEE TEST PROCEDURE FOR AIRBORNE SOUND MEASUREMENTS ON ROTATING ELECTRIC MACHINERY.

This test procedure defines approved methods for conducting tests and reporting results to effect the uniform determination of rotating electric machine sound under steady-state conditions with an accuracy of ± 3 dB tested in free field, reverberant field, and semi-reverberant field acoustical environments. This procedure assumes the presence of pure tones or the predominance of discrete frequencies in the sound spectrum.

20.1.2 IEEE STD 219-1975 RECOMMENDED PRACTICES ON AUDIO AND ELECTROACOUSTICS: LOUDSPEAKER MEASUREMENTS.

These Recommended Practices define terms associated with loudspeakers and their testing, recommend various methods of testing, and indicate preferred methods of presenting information regarding their characteristics.

While the physical data which can be obtained are a helpful guide in designing and in selecting a loudspeaker for a certain purpose, they are not a complete guarantee that the subjective performance will be satisfactory. Wherever it is possible, the quality of reproduction should be checked by means of listening tests.

(Note: Also see ANSI S1.5-1963 (R1971)).

20.1.3 IEEE STD 258-1965 TEST PROCEDURE FOR CLOSE-TALKING PRESSURE-TYPE MICROPHONES.

This document describes a practical and reproducible method of evaluating the performance characteristics of a close-talking microphone by means of quantitative measurements of the microphone characteristics using a standard artificial voice. Terms associated with microphones and their testing are defined. Test procedure, methods of presentation of data, and a standard artificial voice are specified. The tests described in this document involve physical, steady-state measurements only. The data obtained should be sufficient to enable an evaluation of quality and performance of a given microphone in a speech communication system. However, since it is sometimes desirable to obtain a subjective evaluation of a microphone, a procedure for a qualitative performance test is described in Appendix I.

Several sections of the document specify experimental limits to account for the effect of the test procedures on the accuracy of the data. These limits have been chosen so that results within the range of normal engineering accuracy will be obtained.

20.1.4 IEEE STD 297-1969 IEEE RECOMMENDED PRACTICE FOR SPEECH QUALITY MEASUREMENTS.

The IEEE Subcommittee on Subjective Measurements, charged with writing an engineering practice for the measurement of speech quality, concluded that a single method should not now be recommended. This Recommended Practice is concerned only with preference measurements for which three methods are tentatively outlined. These are the Isopreference Method, the Relative Preference Method, and the Category-Judgment Method.

21. Instrument Society of America (ISA)

Purchase standards from:

Instrument Society of America
400 Stanwix Street
Pittsburgh, PA 15222

21.1. Summary of Standards

21.1.1 ISA-S37.10 (1969) SPECIFICATIONS AND TESTS FOR PIEZOELECTRIC PRESSURE AND SOUND-PRESSURE TRANSDUCERS.

Included in this standard are uniform minimum general specifications for describing design and performance characteristics and selected uniform acceptance and qualification test methods, including calibration techniques for piezoelectric transducers for sound pressure levels in excess of 100 dB overall re 20 μPa.

22. International Conference of Building Officials (ICBO)

Purchase standards from:

International Conference of Building Officials
5360 South Workman Mill Road
Whittier, CA 90601

22.1. Summary of Standards

22.1.1 UBC 35-1 LABORATORY DETERMINATION OF AIRBORNE SOUND TRANSMISSION CLASS (STC).

This Standard covers the laboratory measurement of airborne sound transmission loss of building partitions such as walls, floor-ceiling assemblies, doors, and other space-dividing elements.

This Standard also includes a system for establishing a sound transmission class (STC) as a single-figure rating. The rating is designed to correlate with subjective impressions of the sound insulation provided against the sounds of speech, radio, television, music, and similar sources of noise in dwellings.

(Based on Standard Recommended Specifications E90-70, E413-70T, E90-61T of the American Society for Testing and Materials.)

22.1.2 UBC 35-2 IMPACT SOUND INSULATION.

This Standard covers laboratory and field measurement of impact sound transmission through floor-ceiling assemblies and establishes a method of determining an Impact Insulation Class (IIC) as a single-figure rating. The impact sound transmission performance of floor-ceiling assemblies regulated by this Standard is based on measurements of absolute sound pressure levels produced in a room directly below the test floor on which a "standard" tapping machine is operated.

(Based on U. S. Department of Housing and Urban Development Publication FT/TS-24, Guide to Noise Control in Multifamily Dwellings.)

22.1.3 UBC-35-3 AIRBORNE SOUND INSULATION FIELD TEST.

This Standard establishes procedures for the determination of the extent of airborne sound insulation provided by partitions (walls, ceiling, floors and floor-ceiling assemblies) in existing buildings. This standard with UBC 35-1 also establishes a procedure to determine the Sound Transmission Class for field tested assemblies (FSTC or NIC).

(Based on Recommended Practice E336-67T of the American Society for Testing and Materials.)

23. International Electrotechnical Commission (IEC)

Purchase standards from:

American National Standards Institute
1430 Broadway
New York, NY 10018

23.1. Summary of Standards

23.1.1. IEC 34-9 (1972) ROTATING ELECTRICAL MACHINES, PART 9 NOISE LIMITS.

This IEC recommendation represents the first step in setting international limits for rotating electrical machine noise. The need for simplicity is recognized and values for A-weighted sound levels have been adopted. When the machine being tested emits one or more pure tones of significant intensity, the A-weighted level is not sufficient and the recommendation provides for the use of frequency band analysis in such cases. The limits listed are applicable to machines on no-load.

This recommendation covers rotating electrical machines (motors, generators, convertors, etc.) for general application where the electromagnetic design has not been limited to obtain a reduced noise level. It applies to machines in the following power and speed ranges: 1kW to 400 kW and 600 rev/min to 3750 rev/min.

23.1.2. IEC 50(08) (1960) INTERNATIONAL ELECTROTECHNICAL VOCABULARY, ELECTRO-ACOUSTICS.

The purpose of this Recommendation is to list definitions that have been drawn up with the object of striking a correct balance between absolute precision and simplicity.

23.1.3. IEC 118 (1959) RECOMMENDED METHODS FOR MEASUREMENTS OF THE ELECTRO-ACOUSTICAL CHARACTERISTICS OF HEARING AIDS.

The purpose of these recommendations is to describe practicable and reproducible methods of determining certain physical performance characteristics of air-conduction hearing aids that use electronic amplification and are acoustically coupled to the eardrum by means of ear inserts; e.g., ear moulds or similar devices. The acoustic test procedure is based on the free field technique, in which the hearing aid is placed in a plane progressive wave, with the earphone coupled to a standardized coupler. Unless otherwise specified all measurements are carried out without using an ear insert (ear mould) which is normally to be regarded as incorporated in the coupler or the artificial ear employed. The results obtained by the methods specified express the performance under the conditions of the test, but will not necessarily agree exactly with the performance of the hearing aid under practical conditions of use. For this reason, the difference between practical and test conditions must be borne in mind in interpreting the test results.

(Note: Also see ANSI S3.3-1960 (R1971).)

23.1.4. IEC 118 AMENDMENT 1 (1973) RECOMMENDED METHODS FOR MEASUREMENTS OF THE ELECTRO-ACOUSTICAL CHARACTERISTICS OF HEARING AIDS.

This IEC ammendment gives procedures for measurement of the sound pressure level of the 2-cm^3 coupler described in IEC 126(1973). It gives procedures for the connection of the hearing aid for test as well as figures showing coupling configurations for three types of earphones or hearing aids -- the insert earphone, the behind-the-ear type of hearing aid, and the in-the-ear type of hearing aid.

23.1.5. IEC 123 (1961) RECOMMENDATIONS FOR SOUND LEVEL METERS.

The object of the present Recommendation is to specify the characteristics of equipment to measure certain weighted sound pressure levels. The weighting applied to each sinusoidal component of the sound pressure is given as a function of frequency by three standard reference curves, called, A, B, and C.

In practice, measurements may have to be made under very different conditions, ranging from the free field of a single source to a completely diffuse field. In order to simplify the procedure for the calibration and checking of the apparatus, these recommendations are written primarily in terms of the free field response.

23.1.6. IEC 126 (1973) IEC REFERENCE COUPLER FOR THE MEASUREMENT OF HEARING AIDS USING EARPHONES COUPLED TO THE EAR BY MEANS OF EAR INSERTS.

The purpose of this Recommendation is to describe a coupler for loading the earphone with a specified acoustic impedance when determining the physical performance characteristics, in the frequency range 200 to 5000 Hz, of air-conduction hearing aids using earphones coupled to the ear by means of ear inserts, e.g., ear moulds for similar devices. The use of this coupler does not allow the actual performance of a hearing aid on a person to be obtained; however, the IEC recommends its use as a simple and ready means for the exchange of specifications and of physical data on hearing aids.

23.1.7. IEC 177 (1965) PURE TONE AUDIOMETERS FOR GENERAL DIAGNOSTIC PURPOSES.

The audiometer covered by this Recommendation is a device using pure tones designed for general diagnostic use and for determining the hearing threshold levels of individuals by (a) monaural air-conduction earphone listening, and by (b) bone conduction. The Recommendation does not purport to deal with all the features of audiometers, but specifies certain minimum requirements for a pure tone audiometer for general diagnostic use.

The purpose of this Recommendation is to ensure that tests of the threshold of hearing of a given individual on different audiometers, complying with the Recommendation, will give substantially the same results under comparable conditions and that the results obtained will present a good comparison between the threshold of hearing of the individual and the standard reference threshold of hearing. This Recommendation applies primarily to audiometers giving discrete frequencies, but also applies to audiometers giving continuous frequency variation, as far as the provisions are relevant.

23.1.8. IEC 178 (1965) PURE TONE SCREENING AUDIOMETERS.

The audiometer covered by this Recommendation is a device designed for screening purposes by monaural air-conduction earphone listening using pure tones. The Recommendation is almost identical to IEC Publication 177 in its specifications for air-conduction. Notable differences are (a) the range of frequencies and the range of sound pressure levels are smaller, and (b) the tolerances for the accuracies of the sound pressure levels are larger.

23.1.9. IEC 179 (1973) PRECISION SOUND LEVEL METERS.

This Recommendation applies to sound level meters for high precision apparatus for laboratory use, or for accurate measurements in which stable, high fidelity and high quality apparatus are required. This Recommendation does not apply to apparatus for measuring discontinuous sounds or sounds of very short duration.

23.1.10. IEC 179A (1973) FIRST SUPPLEMENT TO PUBLICATION 179 (1973) PRECISION SOUND LEVEL METERS, ADDITIONAL CHARACTERISTICS FOR THE MEASUREMENT OF IMPULSIVE SOUNDS.

This IEC recommendation specifies the characteristics of an apparatus for measuring sounds including sounds of short duration, single impulses and sequences of impulses (pulses).

The apparatus specified in this recommendation complies with the requirements for the precision sound level meter described in IEC Publication 179 and, in addition, is suitable for measuring impulsive sounds when the purpose is to obtain a value representative of the approximate loudness.

23.1.11. IEC 200 (1966) METHODS OF MEASUREMENT FOR LOUDSPEAKERS.

This Recommendation applies only to a single direct-radiator electrodynamic loudspeaker of the moving-coil type. If the terminals representing the moving coil are available, it is recommended that they be used, as this gives information about the unit in its most basic form. However, where other elements such as a transformer or a special network form part of the unit, or are prescribed in the manufacturer's specification to be used with the unit, it may be so tested provided that this is clearly stated when presenting the results. Provision is made for different acoustic loads by prescribing three types of mounting.

The object of this Recommendation is to specify, on the simplest possible basis, practical and uniform methods of measuring certain characteristics of loudspeakers, so that discussions between suppliers, users and testing authorities may be based on clearly expressed and reproducible results. The interpretation of the results and an assessment of actual performance are matters of the individual users' experience. This is because uniformity of measuring conditions demands a radical simplification of the acoustical environment, which is an important factor for determining loudspeaker performance; moreover, it should be remembered that the ultimate appeal is to human judgment. For these reasons, the objective measurements recommended need to be supplemented by subjective listening tests under the appropriate conditions if a final assessment is to be made.

23.1.12 IEC 225 (1966) OCTAVE, HALF-OCTAVE AND THIRD-OCTAVE BAND FILTERS INTENDED FOR THE ANALYSIS OF SOUNDS AND VIBRATIONS.

This Recommendation applies to band filters commonly known as octave, half-octave and third-octave band filters of the passive or active type, the latter including amplifier elements, e.g., tubes, valves and/or transistors.

It specifies the most important characteristics of these filters together with the corresponding tolerances.

The object of the Recommendation is to specify the characteristics of band-pass filters to be used in sound and vibration analysis for which octave and third-octave band-pass filters are preferred.

(Note: Also see ANSI S1.11-1966 (R1971).)

23.1.13 IEC 303 (1970) IEC PROVISIONAL REFERENCE COUPLER FOR THE CALIBRATION OF EARPHONES USED IN AUDIOMETRY.

This report describes an interim reference coupler for loading an earphone with a specified acoustic impedance, when calibrating audiometers, in the frequency range of 125 to 8000 Hz. One configuration of this coupler is identical with the National Bureau of Standards 9-A coupler.

The sound pressure developed by an earphone is not, in general, the same in the coupler as in a person's ear. However, the IEC recommends its use as a

simple and ready means for the exchange of specifications on audiometers and for the calibration of earphones used in audiometry.

23.1.14 IEC 318 (1970) AN IEC ARTIFICIAL EAR, OF THE WIDE BAND TYPE, FOR THE CALIBRATION OF EARPHONES USED IN AUDIOMETRY.

This Recommendation relates to the specification of an artificial ear which covers the frequency band 20 to 10000 Hz and is intended for calibrating supra-aural earphones applied to the ear without acoustical leakage. This device is not intended for the calibration of circumaural earphones.

The audiometric artificial ear is a device to permit calibration of earphones used in audiometry and comprises a microphone to measure the sound pressure and an acoustical network so constructed that the acoustical characteristics of the whole approximate to the acoustical characteristics of the mean external human ear.

23.1.15 IEC 327 (1971) PRECISION METHOD FOR THE PRESSURE CALIBRATION OF ONE-INCH STANDARD CONDENSER MICROPHONES BY THE RECIPROCITY TECHNIQUE.

This Recommendation describes the calibration of one-inch condenser microphones used as laboratory standards. It is restricted to reciprocity pressure calibration by the coupler method.

(Note: Also see ANSI S1.10-1966 (R1971).)

23.1.16 IEC 402 (1972) SIMPLIFIED METHODS FOR PRESSURE CALIBRATION OF ONE-INCH CONDENSER MICROPHONES BY THE RECIPROCITY TECHNIQUE.

This Recommendation describes a simplified technique for calibration of condenser microphone cartridges, commonly known as one-inch microphones, based upon reciprocity pressure calibration by the coupler method. The object of this Recommendation is to specify a method of absolute pressure calibration of one-inch condenser microphones used in laboratories for conventional measuring purposes, without requiring the highest obtainable accuracy. The frequency range of the calibration is restricted to 50 Hz-10 kHz.

The calibration method described is based on the reciprocity technique using air in a closed cavity as the coupling medium between the microphones. The calibration procedure is simplified -- at the expense of the total accuracy of the calibration -- in order that the calibration can be carried out without using the most advanced instrumentation and techniques. The error introduced by using this simplified method is estimated to be less than 0.3 dB.

Procedures giving a higher accuracy of calibration are described in IEC Publication 327: Precision Method for Pressure Calibration of One-inch Standard Condenser Microphones by the Reciprocity Technique.

23.1.17 IEC 486 (1974) PRECISION METHOD FOR FREE-FIELD CALIBRATION OF ONE-INCH STANDARD CONDENSER MICROPHONES BY THE RECIPROCITY TECHNIQUE.

This IEC Recommendation describes a method for the free-field reciprocity calibration of one-inch condenser microphone capsules used as laboratory standards.

The object of this recommendation is to specify methods of measuring certain characteristics of standard condenser microphones with high accuracy, so that discussions between testing authorities may be based on clearly expressed and reproducible results. Although the free-field calibration of condenser microphones is a problem of a general nature, this recommendation (as regards specific figures, measures and numbers) is restricted to microphones commonly known as one-inch condenser microphones, having a nominal outer diameter of 0.936 in = 23.77 mm.

23.2. Draft Proposals for New Standards

23.2.1 DEFINITION OF DYNAMIC RANGES AT THE INPUT OF DIGITAL SIGNAL PROCESSING EQUIPMENT FOR ACOUSTICAL MEASUREMENTS.

23.2.2 ELECTRO-ACOUSTICAL PERFORMANCE REQUIREMENTS FOR AIRCRAFT NOISE CERTIFICATION MEASUREMENTS.

23.2.3 AUDIOMETERS.

23.2.4 FREQUENCY WEIGHTING FOR THE MEASUREMENT OF AIRCRAFT NOISE (D-WEIGHTING).

23.2.5 SUPPLEMENT TO IEC 118: RECOMMENDED METHODS FOR MEASUREMENT OF ELECTRO-ACOUSTICAL CHARACTERISTICS OF HEARING AIDS WITH AUTOMATIC GAIN CONTROL (AGC) CIRCUITS.

23.2.6 CONSOLIDATION AND REVISION OF IEC 123 AND IEC 179 SOUND LEVEL METERS.

24. International Organization for Standardization (ISO)

Purchase standards from:

American National Standards Institute
1430 Broadway
New York, NY 10018

24.1. Summary of Standards

24.1.1 ISO R31 PART VII-1965 QUANTITIES AND UNITS OF ACOUSTICS.

This ISO Recommendation is part of a more comprehensive publication dealing with quantities and units in various fields of science and technology. It consists of a table listing the various quantities and units of acoustics, and the respective symbols. Preference is given to the International System of Units.

24.1.2 ISO R131-1959 EXPRESSION OF THE PHYSICAL AND SUBJECTIVE MAGNITUDES OF SOUND OR NOISE.

This ISO Recommendation states that the physical magnitude of sound or noise be expressed by a statement of sound pressure, power or intensity level, and the subjective magnitude as a loudness level in phons or loudness in sones. It also states the interrelationship between phons and sones.

24.1.3 ISO R140-1960 FIELD AND LABORATORY MEASUREMENTS OF AIRBORNE AND IMPACT SOUND TRANSMISSION.

This ISO Recommendation defines methods for measuring the airborne sound insulation of walls and floors, and impact sound on floors, both in the field and in the laboratory.

The way in which the airborne and impact sound fields are generated, the frequency range of measurement and the characteristics of the necessary filters are described. Definitions are also given of the quantity measured in each case, and of the method of normalizing the results to make them comparable.

24.1.4 ISO R226-1961 NORMAL EQUAL-LOUDNESS CONTOURS FOR PURE TONES AND NORMAL THRESHOLD OF HEARING UNDER FREE FIELD LISTENING CONDITIONS.

This ISO Recommendation specifies, for the frequency range 20 to 15000 Hz: (a) The standard relations existing between sound pressure level and frequency for pure tones of equal loudness presented frontally to a listener in a free field. (b) Values for the standard threshold of hearing for pure tones presented frontally in a free field.

24.1.5 ISO 266-1975 ACOUSTICS - PREFERRED FREQUENCIES FOR ACOUSTICAL MEASUREMENTS (Agrees with ANSI S1.6-1967 (R1971).)

This ISO Standard deals with the frequencies used for acoustical measurements. The variety of frequencies being used for acoustical measurement make comparison of results inconvenient. Some of the difficulties arise from the use of frequencies spaced at different intervals or of series starting from different reference frequencies. The purpose therefore, of this ISO Recommendation is to refer all frequency-series to a single reference frequency, and to select other frequencies in such a way as to afford a maximum number of common frequencies in the various series.

For certain acoustical measurements, a constant frequency increment is a suitable spacing. More commonly, however, a constant percentage increment is adopted and the test frequencies then form a geometric series. The present ISO Recommendation deals with the geometric series and is not intended to apply to cases where a constant frequency increment, or other particular spacing would be

more suitable, or where there may be good reasons for the adoption or retention of other frequencies.

24.1.6 ISO R354-1963 MEASUREMENT OF ABSORPTION COEFFICIENTS IN A REVERBERATION ROOM.

This ISO Recommendation describes how a reverberation room should be used to measure, under specified conditions, the sound absorption coefficients of acoustical materials used as wall or ceiling treatments, or the sound absorption of separate objects, such as furniture, persons or space absorbers. The general principle is that the specimen is introduced into the room and the absorption added is computed from measurements of the reverberation time of the room (or the decay rate of the reverberant sound) before and after the introduction of the specimen.

It specifies certain features of the size and shape of the room, the size and disposition of the test specimen, the methods of measuring the reverberation time (or the decay rate of the reverberant sound) and of computing the results, the frequencies to be used and the manner in which the results should be stated.

24.1.7 ISO R357-1963 SUPPLEMENTARY TO R131). EXPRESSION OF THE POWER AND INTENSITY LEVELS OF SOUND OR NOISE.

This ISO Recommendation defines the reference sound power and sound intensity and recommends one picowatt as the reference sound power and one picowatt per square meter as the reference intensity.

24.1.8 ISO R362-1964 MEASUREMENT OF NOISE EMITTED BY VEHICLES.

This ISO Recommendation describes methods of determining the noise emitted by motor vehicles, these being intended to meet the requirements of simplicity as far as is consistent with reproducibility of results and realism in the operating conditions of the vehicle.

It is based primarily on a test with vehicles in motion, the ISO reference test. It is generally recognized to be of primary importance that the measurements should relate to normal town driving conditions, thus including transmission noise, etc. Measurements should also relate to vehicle conditions which give the highest noise level consistent with normal driving and which lead to reproducible noise emission. Therefore, an acceleration test at full throttle from a stated running condition is specified.

Recognizing, however, that different practices were in existence before this Recommendation, specifications of two other methods used are also given in the Appendix. These relate to (a) a test with stationary vehicles, and (b) a test with vehicles in motion, under vehicle conditions which (in the case of certain vehicles) are different from those in the ISO reference test. When either of these tests is used, the relation between the results and those obtained by the ISO reference test should be established for typical examples of the model concerned.

24.1.9 ISO 389-1975 ACOUSTICS STANDARD REFERENCE ZERO FOR THE CALIBRATION OF PURE-TONE AUDIOMETERS.

This ISO standard specifies a standard reference zero for the scale of hearing threshold level applicable to pure-tone audiometers. It states the information in terms of the sound pressure level output of an earphone or an artificial ear or coupler for five different National Standard earphone-coupler combinations. The five sets of reference equivalent threshold sound pressure levels (RETSPL) all refer to the same auditory threshold levels. That is when an earphone, actuated by a voltage that sets up the proper RETSPL in the coupler, is placed on the ear, the applied voltage corresponds to the threshold of hearing.

In addition it gives the corresponding reference equivalent threshold sound pressure levels for eleven audiometric earphones referred to a single type of

coupler, namely, the National Bureau of Standards, Washington, D. C., USA, Type 9-A Coupler. Of these eleven earphones, five are those currently used as reference standards in a number of standardizing laboratories, and the remaining six are other types which have been used on commercial equipment and in audiometric laboratories.

24.1.10 ISO R454-1965 RELATION BETWEEN SOUND PRESSURE LEVELS OR NARROW BANDS OF NOISE IN A DIFFUSE FIELD AND IN A FRONTALLY-INCIDENT FREE FIELD FOR EQUAL LOUDNESS.

This ISO Recommendation specifies, for the frequency range 50 to 10,000 Hz, the difference (in decibels) between sound pressure levels for equal loudness of narrow bands of noise in diffuse and frontally-incident- free sound fields, respectively, under the following conditions:

a) The sound pressure level is measured in the absence of the listener.

b) The listening is binaural.

c) The listeners are otologically normal persons in the age group from 18 to 25 years.

Note: An "otologically normal subject" is understood to be a person in a normal state of health who is free from all signs or symptoms of ear disease and from wax in the ear canal.

d) The sound is a narrow band of noise of less than critical bandwidth.

24.1.11 ISO R495-1966 GENERAL REQUIREMENTS FOR THE PREPARATION OF TEST CODES FOR MEASURING THE NOISE EMITTED BY MACHINES.

This ISO Recommendation is concerned with the procedures to be followed in the objective measurement of the noise emitted by machines. These procedures are not necessarily applicable to noise of an impulsive character. The aim is to indicate the general principles by which specific test codes for noise measurements may be formulated. These general rules give different methods for measuring noise. The specific codes for the various types of machines will have to select the most suitable method having regard to the size of the machine and its application. The codes themselves should contain all the necessary particulars to enable a result to be obtained with the required accuracy.

24.1.12 ISO R507-1970 PROCEDURE FOR DESCRIBING AIRCRAFT NOISE AROUND AN AIRPORT.

This ISO Recommendation provides a means for describing the noise on the ground around an airport produced by one or a number of aircraft, of the same type of different types, operating under any known set of conditions. It specifies the five steps to be followed for this purpose:

a) A method of measurement of the noise.

b) A method of calculating from these data tone-corrected perceived noise levels, taking into account pronounced irregularities in the spectrum such as when pure tones are present.

c) A method of integrating the tone-corrected perceived noise level, thus taking duration into account, to arrive at an effective perceived noise level.

d) A method for mapping noise contours around an airport.

e) Methods of integrating the perceived noise levels due to a number of takeoff and landing operations in a specified period of time to obtain the total aircraft (perceived) noise exposure level, and to obtain the equivalent continuous perceived noise level for that same period.

It is outside the scope (1) to apply this ISO Recommendation directly to helicopters or vertical take-off flight vehicles; or (2) to describe a method for computing from engine data the noise field produced on the ground by a future aircraft.

24.1.13 ISO 512-1974 ROAD VEHICLES - SOUND SIGNALLING DEVICES ON MOTOR VEHICLES, ACOUSTIC STANDARDS AND TECHNICAL SPECIFICATIONS.

This ISO Recommendation deals with sound signalling devices (a) mounted on motor vehicles, (b) functioning with an electrical current, and (c) designed for use outside built-up areas. The aim of this ISO Recommendation is to specify their acoustic properties, such as spectral distribution of acoustic power and sound pressure level, and also their test conditions.

24.1.14 ISO 532-1975 ACOUSTICS - METHOD FOR CALCULATING LOUDNESS LEVEL

This ISO Standard specifies two methods for calculating the loudness or loudness level of a complex sound, which differ not only in the method of analysis of the sound, but also in the principles of computation. The first, Method A, utilizes physical measurements obtained from spectrum analysis in terms of octave bands. The second, Method B, utilizes spectrum analysis in terms of one-third octave bands.

24.1.15 ISO R717-1968 RATING OF SOUND INSULATION FOR DWELLINGS.

This ISO Recommendation describes a method of evaluating the airborne sound insulation and impact sound level in dwellings when the results of measurements made by the method described in ISO Recommendation R140 are available. Reference values at different frequencies are given against which measured values can be compared to arrive at a single airborne sound insulation index and impact-sound index respectively.

24.1.16 ISO R1680-1970 TEST CODE FOR THE MEASUREMENT OF THE AIRBORNE NOISE EMITTED BY ROTATING ELECTRICAL MACHINERY.

This ISO Recommendation has been drafted in accordance with ISO Recommendation R495, and gives the detailed instructions for conducting and reporting tests on rotating electrical machines, to determine the airborne noise characteristics under steady-state conditions.

The test code is divided into two parts -- Part I: Methods for usual tests based on A-weighted sound level measurements, and Part II: Methods for special tests based on frequency band analysis measurements.

This test code for the measurement of noise applies to rotating electrical machines such as motors and generators of all sizes without limitation of output or voltage, when fitted with their normal auxiliaries.

24.1.17 ISO R1761-1970 MONITORING AIRCRAFT NOISE AROUND AN AIRPORT.

This ISO Recommendation describes methods for monitoring, on the ground, the noise produced by aircraft around an airport, and equipment to be used.

Monitoring is understood to be routine measurement of noise created by aircraft in the operation of an airport. Monitoring usually involves a large number of measurements per day, from each of which an immediate indication of the noise may be required.

Monitoring aircraft noise can be carried out either with mobile equipment, often with only a sound level meter, or with permanently installed equipment incorporating one or more microphones with amplifiers located at different positions in the field with a data transmission system linking the microphones to

a central recording installation. This ISO Recommendation describes primarily the latter method, but specifications given in this ISO Recommendation should also be followed when using mobile equipment to the extent to which the specifications are relevant.

The noise levels to be reported according to this Recommendation are approximations to perceived noise level (PNL).

24.1.18 ISO R1996-1971 ACOUSTICS - ASSESSMENT OF NOISE WITH RESPECT TO COMMUNITY RESPONSE.

The reduction, or limitation, of noise which causes annoyance is of increasing general importance. This ISO Recommendation suggests methods for measuring and rating noises in residential, industrial and traffic areas with respect to their interference with rest, working efficiency, social activities and tranquility.

The Recommendation calls for measurement of A-weighted sound level in decibels. The equivalent steady sound level is obtained by appropriate measurement of the fluctuating noise in a community, or by duration corrections added to measured maximum sound levels. Further corrections are added to the equivalent steady sound level for impulsive or tonal character, to determine the rating sound level. A criterion noise level is described that is further adjusted for time of day and type of district; in special cases the prevailing ambient noise in the community, in the absence of allegedly offending noise, may be used as the adjusted criterion noise level. The actual assessment of noise with respect to community response is obtained from the amount in decibels by which the rating sound level exceeds the adjusted criterion noise level.

When corrective measures are required, a frequency analysis of the offending noise may be necessary. The resulting noise spectrum may be compared with noise-rating (NR) curves given in the Appendix, in order to identify the frequency bands in which the offending noise is predominant.

24.1.19 ISO R1999-1975 ACOUSTICS - ASSESSMENT OF OCCUPATIONAL NOISE EXPOSURE FOR HEARING CONSERVATION PURPOSES.

This ISO Recommendation provides a method for estimating risks of hearing impairment due to exposure to noise. It is intended to facilitate the setting of limits for tolerable exposure to noise during work, and the institution of programs for conservation of hearing.

The equivalent continuous noise level to which a person is exposed during a 40-hour work week is to be calculated from the A-weighted sound level and duration of each noise. From a table in the Recommendation, a partial noise exposure index can be assigned to each noise. The sum of these indices is the composite noise exposure index. Corresponding to this composite noise exposure index, in a second table, the equivalent continuous sound level and the risk of impairment of hearing (for conversational speech) that will occur solely as a result of exposure to the noise during normal working periods up to 45 years. This is risk in addition to that of normal aging.

When noise control means are adopted to reduce the noise to which a person is exposed, it may be necessary to analyze the noise in octave or 1/3 octave bands. An example is given in the Appendix for calculating from an octave band spectrum the A-weighted sound level to which a person wearing ear protectors is exposed.

The Recommendation does not apply to impulsive noises consisting of noises of a duration each less than one second, or single, short, high-level transients such as from gunfire.

24.1.20 ISO R2151-1972 MEASUREMENT OF AIRBORNE NOISE EMITTED BY COMPRESSOR/ PRIMEMOVER UNITS INTENDED FOR OUTDOOR USE.

This ISO Recommendation is designed to assist in the measurement of airborne noise emitted by outdoor compressors. The information is then used to (a) predict the disturbance in the neighborhood of a particular machine, (b) assess the risk of hearing damage for people working in the immediate vicinity of the machine, or (c) compare the acoustic properties of different makes of machines.

This Recommendation specifies a method of determining, for the above listed purposes, the air-borne sound emitted by compressor/primemover units intended for outdoor use and gives instructions for conducting the tests and reporting the results.

24.1.21 ISO R2204-1973 GUIDE TO THE MEASUREMENT OF ACOUSTICAL NOISE AND EVALUATION OF ITS EFFECT ON MAN.

This ISO Recommendation is a guide to the general procedures for the measurement of noise and evaluation of its effects on man. It is intended as an introduction to the more specialized instructions contained in acoustical test codes and interpretation procedures published by national and international standardizing bodies.

24.1.22 ISO 2249-1973 ACOUSTICS - DESCRIPTION AND MEASUREMENT OF PHYSICAL PROPERTIES OF SONIC BOOMS.

The ISO Standard establishes the terminology for describing the physical properties of sonic booms caused by overflight of supersonic aircraft, and specifies the minimum performance requirements of equipment and the method to be used for their measurement. The conditions of measurement envisaged include those in which the direction and time of arrival of the pressure disturbance and even its approximate intensity are not necessarily known in advance. The standard provides the basis for the measurement and description of sonic boom pressure signatures suitable for evaluating their effects on people, structures, animals and unstable terrain features.

24.1.23 ISO 2922-1975 ACOUSTICS - MEASUREMENTS OF NOISE EMITTED BY VESSELS ON INLAND WATER-WAYS AND HARBOURS.

This ISO Standard specifies the conditions for obtaining reproducible and comparable measurements of the noise level and the noise spectrum emitted by vessels of all kinds on inland water-ways and harbours. This International Standard can also be applied to small sea-going vessels, harbour vessels and dredgers. Specifications for intake or exhaust noise measurement and measurements with stationary vessels are also given.

24.1.24 ISO 2923-1975 ACOUSTICS - MEASUREMENT OF NOISE ON BOARD VESSELS.

This ISO Standard specifies the conditions for obtaining reproducible and comparable measurements of the noise level and the noise spectrum on board vessels. The results may be used, for example, to compare various vessels; to characterize the acoustic comfort on board these vessels; and to orient a program of more elaborate measurements for the purposes of studying noise reduction procedures.

24.1.25 ISO 3095-1975 ACOUSTICS - MEASUREMENT OF NOISE EMITTED BY RAILBOUND VEHICLES.

This ISO Standard specifies the conditions for obtaining reproducible and comparable measurements of the noise level and the noise spectrum emitted by all kinds of vehicles operating on rails or other types of fixed track. Specifications for exhaust or air-intake noise measurement and measurements with stationary and accelerating vehicles and for measurements at stations, on bridges or viaducts and in tunnels are also given.

24.1.26 ISO/TR 3352-1974 ACOUSTICS - ASSESSMENT OF NOISE WITH RESPECT TO ITS EFFECT ON THE INTELLIGIBILITY OF SPEECH.

This ISO Technical Report describes a practical survey method for assessment of the influence of noise on sentence intelligibility in direct communication. A simplified method is described for the estimation of the maximum distance between speaker and listener as a function of the characteristics of the noise.

24.1.27 ISO 3741-1975 ACOUSTICS - DETERMINATION OF SOUND POWER LEVEL OF NOISE SOURCES - PRECISION METHODS FOR BROAD-BAND SOURCES IN REVERBERATION ROOMS.

This ISO Standard specifies a direct method and a comparison method for determining the sound power level produced by a source. It specifies test room requirements, source location and operating conditions, instrumentation and techniques for obtaining an estimate of mean-square sound pressure from which the sound power level of the source in octave or one-third octave bands is calculated.

24.1.28 ISO 3742-1975 ACOUSTICS - DETERMINATION OF SOUND POWER LEVEL OF NOISE SOURCES - PRECISION METHODS FOR DISCRETE-FREQUENCY AND NARROW-BAND SOURCES IN REVERBERATION ROOMS.

This ISO Standard specifies the special requirements that are necessary for accurate determinations of the sound power when discrete frequencies or narrow bands of noise are radiated by a source.

24.2. Draft Proposals for New Standards

24.2.1 ISO/DIS 3381 ACOUSTICS - MEASUREMENT OF NOISE INSIDE RAILBOUND VEHICLES.

24.2.2 ISO/DIS 3382 ACOUSTICS - MEASUREMENT OF REVERBERATION TIME IN AUDITORIES.

24.2.3 ISO/DIS 3481 ACOUSTICS - MEASUREMENT OF AIRBORNE NOISE EMITTED BY PNEUMATIC TOOLS AND MACHINES - ENGINEERING METHOD FOR DETERMINATION OF SOUND POWER LEVELS.

24.2.4 ISO/DIS 3740 ACOUSTICS - DETERMINATION OF SOUND POWER LEVEL OF NOISE SOURCES - ENGINEERING METHODS FOR SPECIAL REVERBERATION TEST ROOMS. Part Ø: GUIDELINES FOR THE USE OF BASIC STANDARDS AND FOR THE PREPARATION OF NOISE TEST CODES.

24.2.5 ISO/DIS 3743 ACOUSTICS - DETERMINATION OF SOUND POWER LEVEL OF NOISE SOURCES - ENGINEERING METHODS FOR SPECIAL REVERBERATION TEST ROOMS.

24.2.6 ISO/DIS 3744 ACOUSTICS - DETERMINATION OF SOUND POWER LEVELS OF NOISE SOURCES - ENGINEERING METHODS FOR FREE FIELD CONDITIONS OVER A REFLECTING PLANE.

24.2.7 ISO/DIS 3745 ACOUSTICS - DETERMINATION OF SOUND POWER LEVELS OF NOISE SOURCES - PRECISION METHODS FOR ANECHOIC AND SEMI-ANECHOIC ROOMS.

24.2.8 ISO/DIS 3746 ACOUSTICS - DETERMINATION OF SOUND POWER LEVELS OF NOISE SOURCES. SURVEY METHODS.

24.2.9 ISO/DIS 3891 ACOUSTICS - PROCEDURE FOR DESCRIBING AIRCRAFT NOISE HEARD ON THE GROUND (REVISION OF ISO R/507-1966 AND ISO R/1761-1970).

24.2.10 LABORATORY TESTS ON NOISE EMISSIONS BY APPLIANCES AND EQUIPMENT IN WATER SUPPLY INSTALLATIONS.

24.2.11 SOUND MEASUREMENT PROCEDURES FOR AIR MOVING DEVICES CONNECTED TO EITHER A DISCHARGE DUCT OR AN INLET DUCT.

24.2.12 A GUIDE TO THE EVALUATION OR ASSESSMENT OF NOISE.

24.2.13 REVERBERATION ROOM MEASUREMENT OF SOUND FROM HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT.

24.2.14 METHODS OF MEASUREMENT OF NOISE INSIDE MOTOR VEHICLES.

24.2.15 MEASUREMENT OF NOISE INSIDE AIRCRAFT.

24.2.16 DIGITAL PROCESSING OF ACOUSTICAL SIGNALS.

24.2.17 CODE OF NOISE CLASSIFICATION OF PNEUMATIC EQUIPMENT FOR CONSTRUCTION SITES.

24.2.18 NOISE LEVEL MEASUREMENT AT THE OPERATOR'S WORKPLACE ON AGRICULTURAL TRACTORS AND FIELD MACHINERY.

24.2.19 ACOUSTICS - NOISE FROM EARTH MOVING MACHINERY - DETERMINATION OF SOUND POWER LEVEL.

24.2.20 METHOD OF CONTROL OF NOISE EMITTED BY STATIONARY MOTOR VEHICLES.

24.2.21 THE MEASUREMENT OF AIRBORNE NOISE EMITTED BY COMPRESSOR UNITS INCLUDING PRIMEMOVERS - ENGINEERING METHOD FOR DETERMINATION OF SOUND POWER LEVEL.

24.2.22 ACOUSTICS - NOISE FROM EARTH MOVING MACHINERY - MEASUREMENT AT OPERATOR'S WORKPLACE.

24.2.23 ACOUSTICS - DETERMINATION OF AIRBORNE NOISE EMITTED BY EARTH MOVING MACHINERY TO THE SURROUNDINGS - SURVEY METHOD.

24.2.24 ACOUSTICS - DETERMINATION OF AIRBORNE NOISE EMITTED BY CIVIL ENGINEERING EQUIPMENT FOR OUTDOOR USE.

24.2.25 ACOUSTICS - SURVEY METHOD FOR THE MEASUREMENT OF NOISE EMITTED BY STATIONARY VEHICLES.

24.2.26 ACOUSTICS - MEASUREMENT OF NOISE EMITTED BY ROAD VEHICLES.

24.2.27 ACOUSTICS - DESIGNATION OF NOISE EMITTED BY MACHINERY AND EQUIPMENT.

24.2.28 ACOUSTICS - RECOMMENDED METHODS FOR MEASURING THE INTELLIGIBILITY OF SPEECH.

24.2.29 ACOUSTICS - MEASUREMENT OF SOUND ATTENUATION OF HEARING PROTECTORS.

24.2.30 ACOUSTICS - NOISE CLASSIFICATION OF EQUIPMENT AND MACHINERY.

24.2.31 REFERENCE ACOUSTICAL QUANTITIES.

25. Military Specifications

Purchase standards from:

Commanding Officer
Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

25.1. Summary of Standards

25.1.1 MIL-S-503A (1971) SIRENS, ELECTRIC, 2 and 5 HORSEPOWER.

This specification covers nondirectional electric-motor-driven sirens rated at 600 volts or less, complete with all controls and auxiliary equipment and suitable for mounting in the open on roofs or other supporting structures without additional protection from the weather.

25.1.2 MIL-STD-740B (SHIPS) (1965) AIRBORNE AND STRUCTUREBORNE NOISE MEASUREMENTS AND ACCEPTANCE CRITERIA OF SHIPBOARD EQUIPMENT.

This standard covers acceptable instrumentation and procedures for the measurement of and acceptance criteria for, airborne and structureborne noise of Naval shipboard equipment. This Standard is intended to supplement equipment, shipbuilding and purchase specifications, and similar documents, applicable to all Naval shipboard equipment required to be quieter than equipment produced by normal production practices, except that structureborne noise requirements for main propulsion turbines, main reduction gears, and ship service turbine generator sets are not covered by this standard and will be found in the applicable equipment document.

25.1.3 MIL-STD-1474A (MI) (1975) NOISE LIMITS FOR ARMY MATERIEL.

This standard establishes acoustical noise limits for Army materiel and prescribes the testing requirements and measurement techniques for determining conformance to the noise limits herein. Adherence to the provisions of this standard is intended to; (a) reduce hearing loss among personnel exposed to noise caused by Army materiel; (b) improve speech communications in the noise environment of Army materiel; (c) when appropriate, decrease possibility of aural detection of Army materiel by an enemy; (d) assure that Army materiel meets applicable state and federal noise limits as well as the provisions of TB MED 251. This standard is neither a hearing damage-risk criterion nor a hearing conservation criterion. It is a design standard, evolved from consideration of hearing damage-risk, speech intelligibility, aural detection, state-of-the-art of noise reduction and federal and state legislation, and is intended to cover typical operational conditions. This standard is applicable to design of all new systems, subsystems, equipment and facilities which emit acoustic noise to personnel areas.

25.1.4 MIL-STD-1621A (NAVY) (1973) ACOUSTICAL AND VIBRATIONAL STANDARD REFERENCE QUANTITIES.

This standard covers reference quantities to be used in reporting of all acoustical and vibrational quantities expressed in terms of levels. It also defines acoustical terms and prescribes the plotting format for acoustical measurements. This standard applies to new construction and to procurement contracts for installed systems and equipment. It also applies to the reporting of acoustical data generally, except where old construction and procurement contracts for installed systems require otherwise. It does not apply to acoustical ranging to determing vulnerability to acoustical mines.

25.1.5 MIL-S-3485B (1966) SIRENS, ELECTRIC-MOTOR-OPERATED, VEHICULAR.

This specification covers weatherproof electric-motor-driven sirens with and without a flasher light for vehicles.

25.1.6 MIL-S-6144A (1963) SOUND AND THERMAL INSULATION FOR AIRCRAFT, GENERAL SPECIFICATION FOR THE INSTALLATION OF.

This specification covers general requirements for the installation of sound and thermal insulation in aircraft.

25.1.7 MIL-A-8806A (1) (1961) ACOUSTICAL NOISE LEVEL IN AIRCRAFT, GENERAL SPECIFICATION FOR.

This Specification covers the general requirements for the control of acoustical noise in occupied spaces of aircraft, including the acceptable noise levels and the testing requirements for determining conformance to these levels.

25.1.8 MIL-S-008806B (1970) SOUND PRESSURE LEVELS IN AIRCRAFT, GENERAL SPECIFICATION FOR.

This limited coordination military specification has been prepared by the Air Force based upon currently available technical information, but is has not been approved for promulgation as a revision of Military Specification MIL-A-8806. It is subject to modification. However, pending its promulgation as a coordinated military specification, it may be used in procurement.

This Specification covers the general requirements for maximum allowable sound pressure levels in aircraft crew and passenger compartments and the testing requirements for determining conformance to these levels.

25.1.9 MIL-A-15303M (SHIPS) (1969) AUDIBLE SIGNALS: ALARMS, BELLS, BUZZERS, HORNS AND SIRENS - SHIPBOARD.

This specification covers various types of audible signals for alarm and signaling purposes on Navy ships.

25.1.10 MIL-A-23054 (SHIPS) (1961) ACOUSTICAL ABSORPTIVE BOARD, FIBROUS GLASS, PERFORATED FIBROUS GLASS CLOTH FACED.

This specification covers fibrous glass acoustical absorptive board with a perforated fibrous glass cloth facing.

25.1.11 MIL-S-52739 (ME) (1973) SIRENS: ELECTRIC-MOTOR, FLUID AND INTERNAL COMBUSTION ENGINE OPERATED.

This specification covers electric-motor-driven, air and steam, and internal combustion engine operated sirens.

26. National Electrical Manufacturers Association (NEMA)

Purchase standards from:

National Electrical Manufacturers Association
815 15th Street, Ste. 438
Washington, D.C. 20005

26.1. Summary of Standards

26.1.1 NEMA LE2-1974 H-I-D LIGHTING SYSTEM NOISE CRITERION (LS-NC) RATINGS.

This Standards Publication includes definitions and a description of the testing facilities and equipment, testing procedures and calculation procedures to determine a rating, consisting of a single number, which will describe the background noise level of an enclosed space that will mask the hum produced by H-I-D lighting systems. The rating in accordance with this publication is known as the "Lighting System Noise Criterion (LS-NC) Rating".

26.1.2 NEMA MG1-12.49 (1972) MOTORS AND GENERATORS METHODS OF MEASURING MACHINE NOISE.

This Standard describes test methods for measuring the noise levels associated with unloaded motors and generators. The methods are those of the IEEE Publication Number 85.

26.1.3 NEMA MG3-1974 SOUND LEVEL PREDICTION FOR INSTALLED ROTATING ELECTRICAL MACHINES.

Due to the recent emphasis on health and safety considerations, a large number of people with no special training in sound have had noise control problems thrust upon them. This booklet provides a method of predicting approximate sound pressure levels in industrial and commercial areas. The method is intended for estimating sound pressure levels and should not be construed as a guarantee of results. It requires a knowledge of the sound levels, location of all sound sources, and room characteristics. For simplicity, emphasis is placed on the use of overall A-weighted sound levels.

26.1.4 NEMA TR1-1974 TRANSFORMERS, REGULATORS AND REACTORS (SECTION 9-04 AUDIBLE SOUND LEVEL TESTS).

This Standard lists test conditions and measurement procedures for determining the audible sound level associated with transformers under field conditions.

26.1.5 NEMA SM33-1964 GAS TURBINE SOUND AND ITS REDUCTION. (Discontinued, See Scope.)

This Standards Publication contains information relative to gas turbine inlet and exhaust Sound Pressure Levels and sound reduction to satisfy surrounding neighborhood requirements external to the turbine room in the far field (airborne sound). (Other sources of sound, such as fans for oil coolers, acoustic leakage through buildings housing the equipment, etc., are not covered in this publication.)

(This standard has been discontinued by NEMA due to their departure from the gas turbine field. It is included since it is still being used by individuals active in the gas turbine field.)

27. National Fluid Power Association (NFPA)

Purchase standards from:

National Fluid Power Association
3333 N. Mayfair Road
Milwaukee, WI 53222

27.1. Summary of Standards

27.1.1 NFPA T39.12-1970 (R1975) METHOD OF MEASURING SOUND GENERATED BY HYDRAULIC FLUID POWER PUMPS.

This Standard considers only sound directly radiated from hydraulic fluid power pumps in terms of loudness, disregarding installation effects. Its purpose is to establish a uniform basis for measuring, reporting, and accurately comparing the sound levels of such pumps.

27.1.2 NFPA T3.9.14 (1971) METHOD OF MEASURING SOUND GENERATED BY HYDRAULIC FLUID POWER MOTORS.

This Standard considers only sound directly radiated from hydraulic fluid power rotary motors in terms of loudness, disregarding installation effects. Its purpose is to establish a uniform basis for measuring, reporting, and accurately comparing the sound levels of such motors.

27.2. Draft Proposals for New Standards

27.2.1 NFPA T39.24-19XX DETERMINATION OF FLUID BORNE NOISE LEVEL OF HYDRAULIC FLUID POWER PUMPS.

28. National Machine Tool Builders Association (NMTBA)

Purchase standards from:

National Machine Tool Builders Association
7901 West Park Drive
McLean, VA 22101

28.1. Summary of Standards

28.1.1 NMBTA TECHNIQUE (1970) NOISE MEASUREMENT TECHNIQUES.

The purpose of this document is to delineate suggested measuring techniques and procedures for the determination of noise emanating from machine tools. These procedures apply to measurements made in facilities under the control of the machine tool builder. As such it is assumed that the builder will provide a suitable test space so that reasonably accurate noise level data may be obtained and possibly repeated at a later date. Therefore, ambient noise and reverberation correction factors are not included.

29. National School Supply and Equipment Association (NSSEA)

Purchase standards from:

National School Supply and Equipment Association
Folding Partition Subsection
1500 Wilson Boulevard
Arlington, VA 22209

29.1. Summary of Standards

29.1.1 NSSEA TEST PROCEDURE (R1972) TESTING PROCEDURES FOR MEASURING TRANSMISSION LOSS THROUGH MOVABLE AND FOLDING WALLS.

The test procedure detailed in this booklet grew out of a long time need, on the part of school officials, architects and others, for a definitive and workable method of comparing the sound transmission loss characteristics of movable walls. The procedure for the test itself has been standardized by the American Society for Testing and Materials (ASTM E90). But it is necessary, in addition, to standardize the way the test specimen is installed, how its construction is certified, and other details of the conduct of the test.

The test results stated in any NSSEA certificate apply to a movable wall tested in accordance with the procedures outlined and under stated laboratory conditions. Certification of test results will not be construed as certifying that a movable wall of the same construction will give, under other than laboratory conditions, identical results. For in a field installation, the movable wall is not the only path for noise to pass from one room to the next. Other paths may be ceiling plenums, hollow floors, ventilation ducts, windows and doors, or hollow walls.

30. Power Saw Manufacturers Association (PSMA)

Purchase standards from:

Power Saw Manufacturers Association
Box 7256
Belle View Station
Alexandria, VA 22307

30.1. Summary of Standards

30.1.1 PSMA STANDARD N1.1.-66. NOISE LEVEL.

This Standard establishes a noise level certification procedure for measuring the noise emitted by power saws for infrequent commercial operation in residential areas.

30.1.2 PSMA STANDARD N2.1-67. NOISE OCTAVE BAND MEASUREMENT.

This Standard establishes a test procedure for measuring noise level at the power saw operator's ear.

31. Public Building Service (PBS)

Purchase standards from:

General Services Administration
Public Building Service
Office of Construction Management
Criteria and Research Branch
GSA Building
19th and F Street, N.W.
Washington, D.C. 20405

31.1. Summary of Standards

31.1.1 PBS - C.1 (1972) TEST METHOD FOR THE DIRECT MEASUREMENT OF SPEECH-PRIVACY POTENTIAL (SPP) BASED ON SUBJECTIVE JUDGMENTS.

It is the purpose of this test method to define the Speech-Privacy Potential and related quantities and define a method for their direct measurement or determination in a building system prototype or in the field.

31.1.2 PBS - C.2 (1972) TEST METHOD FOR THE SUFFICIENT VERIFICATION OF SPEECH-PRIVACY POTENTIAL (SPP) BASED ON OBJECTIVE MEASUREMENTS INCLUDING METHODS FOR THE RATING OF FUNCTIONAL INTERZONE ATTENUATION AND NC-BACKGROUND.

It is the purpose of this test method to define the noise Isolation Class, the NC-Background and related Quantities, with respect to the requirements of speech privacy in the open-plan and closed-room portions of building space, and to define methods for their direct measurement for verification of the Speech-Privacy Potential (SPP).

31.1.3 PBS 4-1310 (1969) GUIDE SPECIFICATION, AUDIOMETRIC TEST ROOMS, INSTRUCTIONS FOR USE.

This specification gives requirements for the fabrication and installation of audiometric test rooms.

31.1.4 PBS: 4-1515-71 GUIDE SPECIFICATION, VIBRATION ISOLATION (FCGS 15140 (1972)).

This specification includes vibration isolation, equipment balancing requirements, and sound level criteria for equipment spaces and exterior mounted equipment.

31.1.5 PBS: 4-13500 (1974) GUIDE SPECIFICATION, INTEGRATED CEILING AND BACKGROUND (ICB) SYSTEM.

This specification gives, in addition to other requirements, acoustic requirements for the Integrated Ceiling and Background System which includes mechanical suspension systems, acoustical tile or lay-in panels, air terminals, luminaries, NC Background distribution system, and necessary connection and interface with other building elements, as required to provide lighting supply and return of conditioned air, and other specified performance.

31.1.6 PBS: 225-1A (INT) (1964) INTERIM GUIDE SPECIFICATION, ACOUSTICAL PLASTER.

This specification gives, in addition to other installation requirements, sound control requirements for acoustical plaster.

31.1.7 PBS: T4-10630 (1975) TENATIVE GUIDE SPECIFICATION, FREE STANDING SPACE DIVIDERS.

This tenative specification gives, in addition to other requirements, acoustic performance requirements to be obtained by laboratory or field testing for free standing space dividers. Two types of free standing space dividers are

included, (1) those which will provide speech privacy in the proper acoustical environment, and (2) those which will only provide visual privacy but have sound absorbing capability. This specification is to be used to procure free standing space dividers only for those projects in which the acoustical performance specified in PBS: 4-13500 has been provided.

31.1.8 PBS: T4-10631 (1975) TENATIVE GUIDE SPECIFICATION, FREE STANDING SPACE DIVIDERS (ACOUSTICAL BARRIER TYPE).

This tenative specification is essentially similar to PBS: T4-10631 for acoustical barrier type free standing space dividers. It is to be used when only free standing space dividers which will provide speech privacy in the proper acoustic environment are to be procured and only for those projects in which the acoustical performance specified in PBS: 4-13500 has been provided.

31.1.9 PBS: T4-10632 (1975) TENATIVE GUIDE SPECIFICATION, FREE STANDING SPACE DIVIDERS (VISUAL BARRIER TYPE WITH SOUND ABSORBING CAPABILITY).

This tenative specification is essentially similar to PBS: T4-10631 for visual barrier type free standing space dividers with sound absorbing capability. It is to be used only where a condition of speech privacy is not required or where speech privacy cannot be achieved because of inadequate ceiling acoustical performance specified in PBS: 4-13500.

32. Society of Automotive Engineers (SAE)

Purchase standards from:

Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale, PA 15096

32.1. Summary of Standards

32.1.1 SAE J34 (1973) SAE RECOMMENDED PRACTICE, EXTERIOR SOUND LEVEL MEASUREMENT PROCEDURE FOR PLEASURE MOTORBOATS.

This SAE Recommended Practice establishes the procedure for measuring the maximum exterior sound level for pleasure motorboats under 65 ft (19.8 m) in length, and describes the instrumentation, test site, and boat operation for determining the sound level.

32.1.2 SAE J47 (1975) SAE RECOMMENDED PRACTICE, MAXIMUM SOUND LEVEL POTENTIAL FOR MOTORCYCLES.

This SAE Recommended Practice establishes the test procedure, environment and instrumentation for determining maximum sound level potential for motorcycles.

32.1.3 SAE J57 (1973) SAE RECOMMENDED PRACTICE, SOUND LEVEL OF HIGHWAY TRUCK TIRES.

This SAE Recommended Practice establishes a test procedure for measuring the sound level produced by tires intended primarily for highway use on motor trucks, truck tractors, trailers and semitrailers, and buses. The procedure provides for the measurement of the sound generated by a set of test tires, mounted on the rear axle operated at 50 mph (80 km/h) and at maximum rated tire load. Specifications for the instrumentation, the test site, and the operation of the test vehicle are set forth to minimize the effects of extraneous sound sources and to define the basis of reported levels.

32.1.4 SAE J88a (1975) SAE RECOMMENDED PRACTICE, EXTERIOR SOUND LEVEL MEASUREMENT PROCEDURE FOR POWERED MOBILE CONSTRUCTION EQUIPMENT.

This SAE Recommended Practice sets forth the instrumentation and procedure to be used in measuring exterior sound levels for powered mobile construction equipment of 20 rated bhp and over. It is not intended to cover operation of safety devices (such as backup alarms) air compressors, jack hammers, and machinery designed primarily for operation on highways or within factories, aircraft, or recreational vehicles such as snowmobiles and boats. The sound levels obtained by using the test procedures set forth in this SAE Recommended Practice are repeatable and are representative of the higher range of sound levels generated by the machinery under actual field operating conditions, but do not necessarily represent the average sound level over a field use cycle.

32.1.5 SAE J184 (1972) SAE RECOMMENDED PRACTICE, QUALIFYING A SOUND DATA ACQUISITION SYSTEM (ANSI S6.1-1973).

Various SAE vehicle noise standards require use of a sound level meter which meets the requirements of International Electrotechnical Commission (IEC) Publication 179, Precision Sound Level Meters, and American National Standard (ANSI) S1.4-1961, Sound Level Meters. The purpose of this Recommended Practice is to provide a procedure for determining if an acoustical data acquisition system has performance equivalent to such a meter.

32.1.6 SAE J192a (1973) SAE RECOMMENDED PRACTICE, EXTERIOR SOUND LEVEL FOR SNOWMOBILES (ANSI S6.2-1973).

This SAE Recommended Practice establishes the maximum exterior sound level for snowmobiles and describes the test procedure, environment, and instrumentation for determining this sound level.

32.1.7 SAE J331a (1975) SAE RECOMMENDED PRACTICE, SOUND LEVELS FOR MOTORCYCLES.

This SAE Recommended Practice establishes the test procedure, environment, and instrumentation for determining sound levels typical of normal motorcycle operation.

32.1.8 SAE J336a (1973) SAE STANDARD, SOUND LEVEL FOR TRUCK CAB INTERIOR.

This SAE Recommended Practice suggests design criteria for maximum truck cab interior sound levels and describes the equipment and procedure for determining this sound level. This Practice applies to new motor trucks and truck-tractors and does not include construction and industrial machinery as outlined in SAE J919a.

32.1.9 SAE J366b (1973) SAE STANDARD, EXTERIOR SOUND LEVEL FOR HEAVY TRUCKS AND BUSES.

This SAE Recommended Practice establishes the maximum exterior sound level for highway motor trucks, truck-tractors, and buses, and describes the test procedure, environment, and instrumentation for determining the maximum sound level. The A-weighted sound level produced by trucks and buses of gross vehicle weight over 6000 lb. shall not exceed 88 dB at a 50 foot distance when measured in accordance with the procedure described.

32.1.10 SAE J377 (1969) SAE STANDARD, PERFORMANCE OF VEHICLE TRAFFIC HORNS.

This SAE Standard establishes the minimum operational life cycles, corrosion resistance, and sound level output for traffic horns (electric) on new automotive highway vehicles. Test equipment, environment, and procedures are specified.

32.1.11 SAE J919a (1971) SAE RECOMMENDED PRACTICE, SOUND LEVEL MEASUREMENTS AT THE OPERATOR STATION FOR AGRICULTURAL AND CONSTRUCTION EQUIPMENT.

This SAE Recommended Practice sets forth the instrumentation and procedure to be used in measuring sound levels at the operator station for agricultural and construction equipment, including mobile outdoor industrial equipment.

32.1.12 SAE J952b (1969) SAE STANDARD, SOUND LEVELS FOR ENGINE POWERED EQUIPMENT.

This SAE Standard establishes maximum sound levels for engine powered equipment and describes the test procedure, environment, and instrumentation for determining these sound levels. It does not include machinery designed for operation on highways or within factories and building areas.

32.1.13 SAE J986a (1972) SAE STANDARD, SOUND LEVEL FOR PASSENGER CARS AND LIGHT TRUCKS (ANSI S6.3-1973).

This SAE Standard establishes the maximum sound level for passenger cars and light trucks and describes the test procedure, environment, and instrumentation for determining this sound level.

32.1.14 SAE J994b (1974) SAE RECOMMENDED PRACTICE, PERFORMANCE, TEST, AND APPLICATION CRITERIA FOR ELECTRICALLY OPERATED BACKUP ALARM DEVICES.

This SAE Recommended Practice establishes criteria for backup alarm devices on construction and mobile outdoor industrial machinery. It also establishes the

equipment and procedure to be used when making such measurements as well as sound level intensity, alarm activation and mounting. The scope of construction and industrial machinery encompasses only mobile equipment, powered by internal combustion engines and generally utilized outside factory and building areas, such as crawler tractors, dozers, loaders, power shovels and cranes, motor graders, paving machines, off-highway trucks, ditchers, trenchers, compactors, scrapers, and wagons.

32.1.15 SAE J1046 (1974) SAE RECOMMENDED PRACTICE, EXTERIOR SOUND LEVEL MEASUREMENT PROCEDURE FOR SMALL ENGINE POWERED EQUIPMENT.

This SAE Recommended Practice establishes the instrumentation and procedure to be used in measuring the maximum exterior sound level for engine powered equipment under 20 rated bhp. It is intended to include equipment such as lawn mowers, snow blowers, tillers, etc. It is not intended to include equipment designed primarily for operation on highways or within factories and buildings, or vehicles such as motorcycles, snowmobiles, and pleasure motor boats that are covered by other SAE Standards or Recommended Practices. This SAE Recommended Practice may also be used when measuring the maximum exterior sound level on similar equipment powered by electricity or other power sources.

32.1.16 SAE J1060 (1973) SAE RECOMMENDED PRACTICE, SUBJECTIVE RATING SCALE FOR EVALUATION OF NOISE AND RIDE COMFORT CHARACTERISTICS RELATED TO MOTOR VEHICLE TIRES.

This SAE Recommended Practice establishes a rating scale for subjective evaluations of noise and discomfort in motor vehicles. Through test procedures utilizing specific vehicles on specific roads, the scale may be utilized to assess the relative contributions of tires to noise and discomfort. The noise and ride comfort characteristics attributed to automotive tires have traditionally been estimated by subjectively assigning number designations (commonly on a 1 to 10 scale) to the audible and tactile sensations observed while traversing a given road course in a vehicle equipped with the tires under evaluation. Regardless of advances in objective measurements of tire properties related to noise and discomfort, subjective evaluation will continue to be necessary for the purpose of establishing the significance of such measurements. The rating scale of this recommendation is applicable to assessment of each of the wide variety of audible and tactile disturbances referred to by such terms as bump, thump, slap, shake, etc.

32.1.17 SAE J1074 (1974) SAE RECOMMENDED PRACTICE, ENGINE SOUND LEVEL MEASUREMENT PROCEDURE.

This SAE Recommended Practice sets forth the equipment, environment, and test procedures to be used in measuring sound levels of engines. The purpose is to provide a uniform method of measuring the maximum acoustical radiation from the exterior surfaces of an engine under representative engine operating conditions. The measured sound levels will be useful in development of engines, comparison of engines, and installation of engines in various applications. The correlation of the measured engine sound levels to the various application sound levels will have to be developed.

32.1.18 SAE J1077 (1975) SAE RECOMMENDED PRACTICE, MEASUREMENT OF EXTERIOR SOUND LEVEL OF TRUCKS WITH AUXILIARY EQUIPMENT.

This SAE recommended practice establishes the test procedures, environment, and instrumentation for determining the maximum exterior sound level of motor truck and truck-tractor combinations which are fitted with auxiliary equipment and are intended for highway operation. It is intended that the procedures are most applicable to vehicles having a gross vehicle weight rating (GVWR) greater than 4540 kg (10,000 lbs).

32.1.19 SAE J1105 (1975) SAE RECOMMENDED PRACTICE, PERFORMANCE, TEST AND APPLICATION CRITERIA OF ELECTRICALLY OPERATED FORWARD WARNING HORN FOR MOBILE CONSTRUCTION MACHINERY.

This SAE Recommended Practice establishes criteria for electrically operated forward warning horns on mobile construction machinery. It establishes (a) forward warning horn performance requirements, (b) measurement technique for horn performance requirements, (c) laboratory environmental tests and, (d) horn activation on the vehicle.

32.1.20 SAE ARP 796 (1969) SAE AEROSPACE RECOMMENDED PRACTICE, MEASUREMENT OF AIRCRAFT EXTERIOR NOISE IN THE FIELD.

The purpose of this Recommended Practice is to define measurement techniques and equipment for acquisition and reduction of basic data on aircraft exterior noise. It is not its purpose to propose use of these techniques or this equipment for research or monitoring-type tests.

32.1.21 SAE ARP 865A(1969) SAE AEROSPACE RECOMMENDED PRACTICE, DEFINITIONS AND PROCEDURES FOR COMPUTING THE PERCEIVED NOISE LEVEL OF AIRCRAFT NOISE.

This SAE Recommended Practice gives definitions and procedures for computing the perceived noise level of aircraft noise. The perceived noise level is a single number rating of the noise based upon objective acoustic measurements which is related to the relative subjective response to the noise. The perceived noise level, as defined in this document, is based only on the noise spectra measured in octave or one-third octave bands of frequency. As such, it is most accurate in rating broadband sounds of similar time duration which do not contain strong discrete frequency components. When additional factors such as the duration and the presence of discrete frequency components are to be taken into account, the effective perceived noise level (EPNL) may be a preferred measure (see SAE ARP 1071).

32.1.22 SAE ARP 866A (1975) SAE AEROSPACE RECOMMENDED PRACTICE, STANDARD VALUES OF ABSORPTION AS A FUNCTION OF TEMPERATURE AND HUMIDITY FOR USE IN EVALUATING AIRCRAFT FLYOVER NOISE.

This report describes a method by which values can be obtained for the absorption of sound in air over a wide range of temperature and humidity conditions. Although it was developed primarily for use in evaluating aircraft fly-over noise measurements, the information should be applicable to other noise problems as well. There are a number of factors which influence the propagation of aircraft noise from an aircraft flying overhead to a point on the ground. The purpose here, however, is to consider only the classical and molecular absorption of sound energy by the atmosphere. It is felt that spherical divergence, scattering, refraction, and other effects should be treated separately.

32.1.23 SAE ARP 1071 (1973) SAE AEROSPACE RECOMMENDED PRACTICE, DEFINITIONS AND PROCEDURES FOR COMPUTING THE EFFECTIVE PERCEIVED NOISE LEVEL FOR FLYOVER AIRCRAFT NOISE.

The effective perceived noise level, EPNL, specified in units of EPNdB, is a single number measure calculated from objective acoustic measurements in accordance with the procedures defined in this document. It is calculated from a time sequence of tone-adjusted perceived noise levels which are calculated from one-third octave band noise spectra. The tone adjustments are determined from one-third octave band spectra, by a procedure which estimates the extent of discrete frequency (tone) components from irregularities in the shape of the one-third octave band noise spectra.

32.1.24 SAE ARP 1080 (1969) SAE AEROSPACE RECOMMENDED PRACTICE, FREQUENCY WEIGHTING NETWORK FOR APPROXIMATION OF PERCEIVED NOISE LEVEL FOR AIRCRAFT NOISE.

There has been an increasing desire for the definition of a frequency

weighting network which could be incorporated into direct reading and other instruments for an estimate of the Perceived Noise Level of an aircraft flyover. This Aerospace Recommended Practice specifies a frequency weighting network (the 40-Noy noisiness contour of ARP 865A, Definitions and Procedures for Computing the Perceived Noise Level of Aircraft Noise) may be used for the approximation of Perceived Noise Level.

32.1.25 SAE AIR 817 (1967) SAE AEROSPACE INFORMATION REPORT, A TECHNIQUE FOR NARROW BAND ANALYSIS OF A TRANSIENT.

This SAE Report describes a technique for analyzing a transient signal of short duration. The standard method of analyzing tape recorded signals of only a few seconds duration is the "loop method". The magnetic tape is cut and spliced to form an endless loop, and the loop is replayed with the aid of a tensioning device. Difficulty arises with transient signals when the length of tape required to make a loop covers a time over which there is a considerable variation. The principle of the system described is that of expanding the timebase of the signal to a point at which there is a length of tape sufficient to make a loop across which the signal is essentially constant. Although the method is one which has been used specifically for the analysis of aircraft flyover noise, it could equally well apply to other transient signals.

32.1.26 SAE AIR 852 (1965) SAE AEROSPACE INFORMATION REPORT, METHODS OF COMPARING AIRCRAFT TAKEOFF AND APPROACH NOISE.

It is the purpose of this Information Report to describe a method for rating complex aircraft noises or noise flyover cycles which cannot be handled by means of mathematical formulae by comparing them with simpler aircraft noises or noise flyover cycles which can be handled by mathematical formulae. The report describes the need for an objective means for rating aircraft noise and recommends areas which should be investigated.

32.1.27 SAE AIR 876 (1965) SAE AEROSPACE INFORMATION REPORT, JET NOISE PREDICTION.

This SAE Report provides calculation procedures for predicting maximum fly-by noise and maximum static ground operation noise from jet aircraft. Three types of engine exhausts are considered: (a) Turbojet with standard circular nozzle. (b) Turbojet with nonstandard nozzle. (c) Turbofan or bypass engine with (1) unmixed exhausts or (2) completely mixed exhausts.

Noise predictions are in terms of octave-band sound pressure levels of maximum air-to-ground fly-by noise or of maximum ground-to-ground side-line noise. These levels may be converted to an over-all sound pressure level or to a subjective rating such as Perceived Noise Level.

32.1.28 SAE AIR 902 (1966) SAE AEROSPACE INFORMATION REPORT, DETERMINATION OF MINIMUM DISTANCE FROM GROUND OBSERVER TO AIRCRAFT FOR ACOUSTIC TESTS.

This SAE Report describes a photographic technique for determining minimum observer-to-aircraft distance during acoustic "fly-over" tests. Possible sources of error are discussed, and it is shown that with ordinary care results are sufficiently accurate to require no correction.

32.1.29 SAE AIR 923 (1966) SAE AEROSPACE INFORMATION REPORT, METHOD FOR CALCULATING THE ATTENUATION OF AIRCRAFT GROUND TO GROUND NOISE PROPAGATION DURING TAKE- OFF AND LANDING.

The purpose of this SAE Report is to provide a standard method for predicting the propagation of noise over open terrain from (a) an airplane on the ground to other locations on the ground and from (b) an airplane at low altitude, - i.e., where ground effects exist -- to locations on the ground at distances which are great compared with the airplane altitude. This report provides extensive information on what has been called the "shadow effect", i.e., attenuation

resulting from temperature and wind gradients near the ground. This effect is called "extra ground attenuation" because it is in addition to the inverse square attenuation and the extra air attenuation.

32.1.30 SAE AIR 1079 (1972) SAE AEROSPACE INFORMATION REPORT, AIRCRAFT NOISE RESEARCH NEEDS.

This Information Report is a classification of current aircraft noise research needs. The areas in which research needs exist are characterized broadly as follows: acoustics areas which have general application to a wide variety of aircraft types and operations; specialized topics in acoustics which relate to certain aircraft or aircraft types; and areas which are not related directly to acoustics but which may play a significant role in aircraft noise alleviation.

32.1.31 SAE AIR 1081 (1971) SAE AEROSPACE INFORMATION REPORT, HOUSE NOISE-REDUCTION MEASUREMENTS FOR USE IN STUDIES OF AIRCRAFT FLYOVER NOISE.

This AIR describes the results of some house noise reduction measurements that were made in five locations in the U. S. in 1966, 1964, 1967, and 1969. The houses used in these tests included a wide range of construction types of single and multiple family dwellings. The house noise reductions also cover a wide range. The average house noise reduction developed in this AIR should be used only when such an average is needed. The principle objective of this AIR is to use these noise reduction measurements to develop curves showing the noise reduction of aircraft flyover noise when the noise passes from the outside to the inside of houses located in various climates. The noise-reduction data presented herein can be applied to measurements of aircraft noise made outdoors in order to estimate the noise levels indoors.

32.1.32 SAE AIR 1115 (1969) SAE AEROSPACE INFORMATION REPORT, EVALUATION OF HEADPHONES FOR DEMONSTRATION OF AIRCRAFT NOISE.

The purpose of this SAE Report is to present the results of an engineering evaluation of commercially available headphones from the standpoints of frequency range, flatness of response and tolerances, and dynamic range.

32.1.33 SAE AIR 1216 (1972) SAE AEROSPACE INFORMATION REPORT, COMPARISONS OF GROUND RUNUP AND FLYOVER NOISE LEVELS.

The principal purpose of this report is to present and discuss, for each aircraft, the differences between flyover sound pressure levels (SPL's) and SPL's projected to comparable flyover conditions from the ground-runup measurements. A second purpose of this report is to present the differences between ground-runup SPL's, measured at comparable distances from the engine, over concrete and over grassy surfaces. Analyses are presented for three different engine power settings for both types of comparisons for both airplanes.

32.2. Draft Proposals for New Standards

32.2.1 SAE XJ919b OPERATOR SOUND LEVEL MEASUREMENT PROCEDURE FOR POWERED MOBILE EARTHMOVING AND CONSTRUCTION MACHINERY -- SINGULAR TYPE TEST (To replace SAE J919a).

32.2.2 SAE XJ1008 EXTERIOR SOUND LEVEL MEASUREMENT PROCEDURE FOR SELF-PROPELLED AGRICULTURAL EQUIPMENT.

32.2.3 SAE XJ1030 MAXIMUM SOUND LEVEL FOR PASSENGER CARS AND LIGHT TRUCKS.

32.2.4 SAE XJ1075 MEASUREMENT PROCEDURE FOR RATING SOUND LEVEL OF CONSTRUCTION JOB SITES.

32.2.5 SAE XJ1096 MEASUREMENT OF EXTERIOR SOUND LEVEL OF HEAVY TRUCKS UNDER STATIONARY CONDITIONS.

32.2.6 OPERATOR SOUND LEVEL MEASUREMENT PROCEDURE FOR POWERED MOBILE EARTHMOVING AND CONSTRUCTION MACHINERY - WORK CYCLE TEST.

32.2.7 RATING OF WARNING HORNS.

32.2.8 INTERIOR SOUND LEVEL MEASUREMENT PROCEDURE FOR PLEASURE MOTOR BOATS.

32.2.9 SOUND LEVEL MEASUREMENT PROCEDURES AT OPERATOR'S EAR FOR SNOWMOBILES.

32.2.10 OPERATOR EAR SOUND LEVEL MEASUREMENT PROCEDURE FOR SMALL ENGINE POWERED EQUIPMENT.

32.2.11 EXTERIOR AND INTERIOR SOUND LEVELS OF COACHES.

32.2.12 EXTERIOR AND INTERIOR SOUND LEVELS OF RAIL RAPID TRANSIT VEHICLES.

32.2.13 RATING OF EXHAUST AND INDUCTION SILENCERS.

32.2.14 TEST PROCEDURE FOR STATIONARY MEASUREMENT OF VEHICLE EXHAUST NOISE.

32.2.15 ACOUSTICAL TERMINOLOGY AND PRESENTATION PRACTICES.

32.2.16 SAE ARP 1157 RECOMMENDED PROCEDURES FOR PRESENTING AND MEASURING AIRCRAFT NOISE IN TESTING OF HUMAN SUBJECTS.

32.2.17 SAE ARP 1158 EFFECTIVE PERCEIVED NOISE LEVEL DETERMINATION BY DIRECT SUBJECTIVE JUDGMENT TEST.

32.2.18 SAE ARP 1264 AIRPLANE FLYOVER NOISE ANALYSIS SYSTEM USED FOR EFFECTIVE PERCEIVED NOISE LEVEL COMPUTATIONS.

32.2.19 SAE ARP 1307 MEASUREMENT OF EXTERIOR NOISE PRODUCED BY AIRCRAFT POWER UNITS (APUs) AND ASSOCIATED EQUIPMENT DURING GROUND OPERATION.

32.2.20 SAE ARP 1323 MEASUREMENT OF AIRCRAFT INTERIOR SOUND PRESSURE LEVELS IN FLIGHT.

32.2.21 SAE AIR 1324 THE EVALUATION OF AIRPLANE INTERIOR NOISE.

32.2.22 SAE AIR 1327 ACOUSTIC EFFECTS PRODUCED BY A REFLECTING PLANE.

32.2.23 PREDICTION FOR NEAR-FIELD AND FAR-FIELD PROPELLOR NOISE.

32.2.24 PREDICTION OF NOISE FROM BLOWN FLAPS FOR STOL AIRCRAFT.

32.2.25 METHODS TO ACCOUNT FOR THE EFFECTS OF GROUND REFLECTIONS ON ACOUSTIC MEASUREMENT.

33. Steel Door Institute (SDI)

Purchase standards from:

Steel Door Institute
2130 Keith Building
Cleveland, OH 44115

33.1. Summary of Standards

33.1.1 SDI 114 (1972) STANDARD ACOUSTICAL PERFORMANCE TEST FOR STEEL DOOR AND FRAME ASSEMBLIES.

The primary purpose of this procedure is to establish minimum standards and methods of testing the effectiveness of steel door and frame assemblies under circumstances that might remotely be considered normal field applications and conditions.

34. Woodworking Machinery Manufacturers Association (WMMA)

Purchase standards from:

Woodworking Machinery Manufacturers Association
1900 Arch Street
Philadelphia, PA 19103

34.1. Summary of Standards

34.1.1 WMMA TEST CODE (1973) TEST CODE FOR EVALUATING THE NOISE EMISSION OF WOODWORKING MACHINERY.

This document establishes a test code for evaluating noise emissions of woodworking machinery. It entails the definition of the terminology to be employed; delineation of a machine classification index; and specifies test conditions, operating conditions, measuring instruments, methods of measurements and procedures for reporting test data.

Appendix A. Summary of Federal Regulations

A.1 DEPARTMENT OF LABOR OCCUPATIONAL NOISE EXPOSURE STANDARD, TITLE 29, CODE OF FEDERAL REGULATIONS, CHAPTER XVII, PART 1910, SUBPART G, 36 FR 10466, MAY 29, 1971.

The Department of Labor's noise exposure standard first was promulgated under the Walsh-Healey Public Contracts Act. It was adopted under the Occupational Safety and Health Act on May 29, 1971, and is applicable under the general industry, construction, and longshore standards. It provides for protection against the effects of noise exposure. The combined effects of the amount of exposure at different sound levels are used to determine the maximum exposure permitted. When these permissible exposure limits are exceeded, feasible administrative (including a continuing hearing conservation program) and/or engineering controls must be implemented. See Table below.

PERMISSIBLE NOISE EXPOSURES[1/]

Duration per day, hours	Sound level dBA slow
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

[1/] When the daily noise exposure is composed of two or more periods of noise exposure at different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C1/T. + C2/T2 .... Cn/Tn exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level.

A.2 DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT CIRCULAR 1390.2, NOISE ABATEMENT AND CONTROL: DEPARTMENTAL POLICY, IMPLEMENTATION RESPONSIBILITIES AND STANDARDS, AUGUST 4, 1971.

This HUD circular requires that noise exposures and sources of noise be given adequate consideration as an integral part of urban environments in connection with all HUD programs which provide financial support to planning. This consideration is to be of a form that provides assurance that new housing and other noise sensitive accommodations will not be planned for areas whose current or projected noise exposures exceed the standards cited in this circular.

The basic requirements are given in the following chart:

EXTERNAL NOISE EXPOSURE STANDARDS FOR NEW CONSTRUCTION SITES
(Measurements and projections of noise exposures are to be made at appropriate heights above site boundaries.)

GENERAL EXTERNAL EXPOSURES dB(A)	AIRPORT ENVIRONS CNR ZONE */	NEF ZONE */
UNACCEPTABLE		
Exceeds 80 dB(A) 60 minutes per 24 hours	3	C
Exceeds 75 dB(A) 8 hours per 24 hours		
(Exceptions are strongly discouraged and require a 102(2)C. environmental statement and the Secretary's approval)		
DISCRETIONARY -- NORMALLY UNACCEPTABLE		
Exceeds 65 dB(A) 8 hours per 24 hours	2	B
Loud repetitive sounds on site		
(Approvals require noise attenuation measures, the Regional Administrator's concurrence and a 102(2) C environmental statement)		
DISCRETIONARY -- NORMALLY ACCEPTABLE		
Does not exceed 65 dB(A) more than 8 hours per 24 hours		
ACCEPTABLE		
Does not exceed 45 dB(A) more than 30 minutes per 24 hours	1	A

*/ See Appendix 2 for explanations of Composite Noise Rating (CNR) and Noise Exposure Forecast (NEF).

A.3 DEPARTMENT OF THE INTERIOR NOISE STANDARD ISSUED UNDER THE FEDERAL COAL MINE HEALTH AND SAFETY ACT, TITLE 30, CODE OF FEDERAL REGULATIONS, CHAPTER I, PARTS 70 AND 71, 35 FR 5544, APRIL 3, 1970; 36 FR 12739, JULY 7, 1971; 37 FR 6368, MARCH 28, 1972; 38 FR 18666, JULY 13, 1973.

This standard is essentially similar to the Department of Labor Noise Exposure Standard (see A.1).

A.4 GENERAL SERVICES ADMINISTRATION, PUBLIC BUILDINGS SERVICE CONSTRUCTION EQUIPMENT AND PRACTICES, PAR. 44.8 IN GUIDE SPECIFICATION PBS 4-01100, OCTOBER 1973.

This regulation sets maximum permissible noise emission levels for construction equipment. These levels are given in the following table:

MAXIMUM PERMISSIBLE NOISE EMISSION LEVELS AT 50 FEET.

	Effective Dates	
Equipment	July 1, 1972	January 1, 1975
Earthmoving		
front loader	79	75
backhoes	85	75
dozers	80	75
tractors	80	75
scrapers	88	80
graders	85	75
truck	91	75
paver	89	80
Materials Handling		
concrete mixer	85	75
concrete pump	82	75
crane	83	75
derrick	88	75
Stationary		
pumps	76	75
generators	78	75
compressors	81	75
Impact		
pile drivers	101	95
jack hammers	88	75
rock drills	98	80
pneumatic tools	86	80
Other		
saws	78	75
vibrators	76	75

A.5 FEDERAL AVIATION ADMINISTRATION NOISE STANDARDS, TITLE 14, CODE OF FEDERAL REGULATIONS, CHAPTER I, PART 36, 34 FR 1864, NOVEMBER 18, 1969, AS AMENDED AT 38 FR 29574, OCTOBER 26, 1973.

This standard outlines procedures for the measurement of aircraft noise emissions as received on the ground. One section is reserved for setting noise limits (not yet specified) for certain aircraft. Noise levels for subsonic transport category and turbojet powered airplanes are given. They are:

(1) For approach and sideline, 108 EPNdB for maximum weights of 600,000 pounds or more, less 2 EPNdB per halving of the 600,000-pound maximum weight down to 102 EPNdB for maximum weights of 75,000 pounds and under.

(2) For takeoff, 108 EPNdB for maximum weights of 600,000 pounds or more, less 5 EPNdB per halving of the 600,000-pound maximum weight down to 93 EPNdB for maximum weights of 75,000 pounds and under.

A.6 DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION VEHICLE INTERIOR NOISE LEVELS, TITLE 49, CODE OF FEDERAL REGULATIONS, CHAPTER III, SUBCHAPTER B, PART 393.94, 38 FR 30880, NOVEMBER 8, 1973.

This regulation specifies motor carrier safety regulations for noise. The interior sound level of motor vehicles must not exceed an A-weighted sound level of 90 decibels as measured by a microphone located six inches to the right of and in the same plane as the driver's right ear. Vehicle operation is as follows: transmission in neutral gear and the engine at maximum governed speed (or if the engine is not equipped with an engine governor, at the speed corresponding to maximum rated horsepower.

A.7 DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION HIGHWAY NOISE CONTROL STANDARDS AND PROCEDURES, TITLE 23, CODE OF FEDERAL REGULATIONS, CHAPTER I, SUBCHAPTER J, PART 772, 38 FR 15953, JUNE 19, 1973, AS AMMENDED AT 39 FR 6696, FEBRUARY 22, 1974.

This regulation provides noise standards and procedures for use by State highway agencies and the Federal Highway Administration (FHWA) in the planning and design of highways approved pursuant to title 23, United States Code, and to assure that measures are taken in the overall public interest to achieve highway noise levels that are compatible with different land uses, with due consideration also given to other social, economic and environmental effects. See Table.

DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

Land use	Design noise level - L_{10}	Description of land use category
	dBA	
A	60 (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	70 (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	75 (Exterior)	Developed lands, properties or activities not included in categories A and B of this subparagraph.
D		For requirements on undeveloped lands see 772.5(a)(5) and (6).
E	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

A.8 CERTIFICATION PROCEDURES FOR LOW-NOISE-EMISSION PRODUCTS, TITLE 40, CODE OF FEDERAL REGULATIONS, PARTS 203.0 - 203.8, 39 FR 6670, FEBRUARY 21, 1974, AS CORRECTED AT 39 FR 7930, MARCH 1, 1974, EFFECTIVE MARCH 25, 1974.

This regulation prescribes procedures for the certification of low-noise-emission products. It does not contain the low-noise-emission criterion nor does it contain the specific data requirements necessary for deciding whether a product is a "suitable substitute." These will be published later.

A.9 ENVIRONMENTAL PROTECTION AGENCY FINAL NOISE EMISSION STANDARDS, MOTOR CARRIERS ENGAGED IN INTERSTATE COMMERCE, TITLE 40, CODE OF FEDERAL REGULATIONS, CHAPTER I, PART 202, 39 FR 38208, OCTOBER 29, 1974.

This regulation establishes final noise emission standards for motor carriers (whose gross vehicle weight or gross combination weight is in excess of 10,000 pounds) engaged in interstate commerce. The regulations stipulate the following allowable A-weighted noise levels:

1) At vehicle speeds of 35 mph or less under any operational condition -- 88 dB.

2) At vehicle speeds in excess of 35 mph under any operational condition -- 92 dB.

3) Stationary maximum acceleration -- 88 dB.

These limits are for a hard surfaced test site for measurements made 50 feet from the centerline of the vehicle. Allowable limits are also prescribed for alternate measurement distances and for soft surfaced test sites.

Appendix B. Committees/Technical Contacts

1. Acoustical and Board Products Association (ABPA)

(formerly Acoustical and Insulating Materials Association (AIMA)

1.1 Technical Committee on Acoustical Material

Technical Contact

R. A. LaCosse
Acoustical and Board Products Association
205 West Touhy Avenue
Park Ridge, IL 60068

2. Acoustical Society of America (ASA)

2.1 ASA Committee on Standards (ASACOS)

Chairman

H. E. von Gierke
Aerospace Medical Research Lab.
Wright Patterson AFB
Dayton, OH 45433

3. Air Conditioning and Refrigeration Institute (ARI)

3.1 Technical Committee on Sound

Chairman

R. W. Ramsey
Heil-Quaker Corp.
Subsidiary of Whirlpool
647 Thompson Lane
Nashville, TN 37204

4. Air Diffusion Council (ADC)

4.1 No active committees at present.

Technical Contact

G. Otto
Air Diffusion Council
435 North Michigan Ave.
Chicago, IL 60611

5. Air Moving and Conditioning Association (AMCA)

5.1 Technical Advisory Committee on Sound

Technical Contact

K. W. Burkhardt
Technical Director
Air Moving and Conditioning Association
30 West niversity Drive
Arlington Heights, IL 60004

6. American Gear Manufacturers Association (AGMA)

6.1 Acoustical Technology Committee

Chairman

W. B adley
hiladelphia Gear Works
King of Prussia, PA 19406

7. American National Standards Institute (ANSI)

7.1 ANSI SI Acoustics

Chairman

E. E. Gross
General Radio Co.
300 Baker Ave.
Concord, A 01742

7.2 ANSI S3 Bioacoustics

Chairman

W. Melnick
Ohio State University
College of Medicine
Dept. of Otolaryngology
3024 University Hospital Clinic
456 Clinic Drive
Columbus, OH 43210

8. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)

8.1 2.6 Sound and Vibration Technical Committee

Technical Contact

N. A. LaCourte
American Society of Heating, Refrigerating, and Air Conditioning Engineers
345 E. 47th St.
New York, NY 10017

9. American Society for Testing and Materials (ASTM)

9.1 ASTM E-33 Environmental Acoustics

Chairman

H. F. Kingsbury
Pennsylvania State University
University Park, PA 16801

10. American Textile Machinery Association (ATMA)

10.1 No active committees at present.

Technical Contact

W. Beckwith
Leesona Corp.
Warwick, RI 02887

11. Anti-Friction Bearing Manufacturers Association (AFBMA)

11.1 Sub-Committee on Vibration and Noise

Chairman

J. C. Morrison
Barden Corp.
200 Park Ave.
Danbury, CT 06810

12. Association of Home Appliance Manufacturers (AHAM)

12.1 AHAM Room Air-Conditioner Sound Sub-Committee

Chairman

R. W. Gilmer
Chrysler Corporation
1600 Webster Street
P. O. Box 1037
Dayton, OH 45404

Technical Consultant to Engineering Standards Committee

M. Naake
General Electric
Major Appliance Business Group
Appliance Park
Louisville, KY 40225

13. Compressed Air and Gas Institute (CAGI)

13.1 No active committees at present.

Technical Contact

A. P. Wherry
Secretary-Treasurer
Compressed Air and Gas Institute
2130 Keith Bldg.
Cleveland, OH 44115

14. Diesel Engine Manufacturers Association (DEMA)

14.1 No active committees at present.

Technical Contact

A. P. Wherry
Secretary-Treasurer
Diesel Engine Manufacturers Association
2130 Keith Bldg.
Cleveland, OH 44115

15. Electronic Industries Association (EIA)

15.1 Electroacoustic Committee

Chairman

P. B. Williams
Rapid Die Molding Co.
Chiller Park, IL 60176

16. Federal Construction Guide Specification (FCGS)

16.1 No active committees at present.

Technical Contact

M. Borger
Executive Secretary
Building Research Advisory Board
Federal Construction Council
2101 Constitution Avenue, N.W.
Washington, DC 20418

17. Federal Specifications

17.1 No active committees at present.

Information

Specification Sales (3FRDS)
Building 197, Washington Navy Yard
General Services Administration
Washington, D. C. 20407

18. Home Ventilating Institute (HVI)

18.1 Sound Subcommittee of Engineering Committee

Technical Contact

D. McClurg
Associate Director
Home Ventilating Institute
230 North Michigan Ave.
Chicago, IL 60601

19. Industrial Silencer Manufacturers Association (ISMA)

19.1 No active committees at present.

Technical Contact

R. J. Yeager, ISMA
c/o Burgess Industries
P. O. Box 47146
Dallas, TX 75247

20. Institute of Electrical and Electronic Engineers (IEEE)

20.1 Acoustical Speech and Signal Processing Standards Committee

Chairman

H. R. Silbiger
Bell Laboratories
3E Corner Crawfords Road 511
Holmdel, NJ 07733

21. Instrument Society of America (ISA)

21.1 No active committees at present.

Technical Contact

R. G. Hand
Manager, Publications, Education and Standards
Instrument Society of America
400 Stanwix Street
Pittsburgh, PA 15222

22. International Conference of Building Officials (ICBO)

22.1 No active committees at present.

Technical Contact

D. R. Watson
Technical Director
International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

23. International Electrotechnical Commission (IEC)

23.1 IEC/TC 29 IEC Technical Committee on Electroacoustics

Chairman

W. W. Lang
IBM Acoustics Lab, Bldg. 704
P. O. Box 390
Poughkeepsie, NY 16203

23.2 IEC/TC 29/SC 29C Measuring Devices

U. S. Technical Advisory Group

ANSI S1 Acoustics
ANSI S2 Mechanical Shock and Vibration
ANSI S3 Bioacoustics

U. S. Technical Advisor

W. R. Kundert
General Radio Co.
300 Baker Ave.
Concord, MA 01742

24. International Organization for Standardization (ISO)

24.1 ISO/TC 43/SC 1 Noise

U. S. Technical Advisory Group

ANSI S1 Acoustics
ANSI S3 Bioacoustics

U. S. Technical Advisor

L. Batchelder
983 Memorial Drive
Cambridge, MA 02138

24.2 ISO/TC 43/SC 2 Building Acoustics

U. S. Technical Advisory Group

ASTM E 33 Environmental Acoustics

U. S. Technical Advisor

Vacant

25. Military Specifications

25.1 No active committees at present.

Information

Commanding Officer
Naval Publications and Forms Center
5801 Tabor Ave.
Philadelphia, PA 19120

26. National Electrical Manufacturers Association (NEMA)

26.1 No active committees at present.

Technical Contact

Ms. V. Morgan
National Electrical Manufacturers Association
155 East 44th Street
New York, NY 10017

27. National Fluid Power Association (NFPA)

27.1 Sound Measurement Coordinating Committee

Chairman

G. Czarnecki
DeLavel
IMO Pump Division
P. O. Box 321
Trenton, NJ 08602

28. National Machine Tool Builders Association (NMBTA)

28.1 No active committees at present.

Technical Contact

W. Atkinson, Jr.
Safety Director
National Machine Tool Builders Association
7901 West Park Drive
McLean, VA 22101

29. National School Supply and Equipment Association (NSSEA

29.1 No active committees at present.

Technical Contact

National School Supply and Equipment Association
1500 Wilson Blvd.
Arlington, VA 22209

30. Power Saw Manufacturers Association (PSMA)

30.1 No active committees at present.

Technical Contact

J. W. Cawthorne
Power Saw Manufacturers Association
Box 7256
Belle View Station
Alexandria, VA 22307

31. Public Building Service (PBS)

31.1 No active committees at present.

Technical Contact

J. Parker
Office of Construction Management
Criteria and Research Branch
Rm. 3306 GSA Bldg.
19th and F Street, N.W.
Washington, DC 20405

32. Society of Automotive Engineers (SAE)

32.1 SAE Committee A-21, Aircraft Noise Measurement

Chairman

F. W. Kolk
American Airlines, Inc.
633 Third Ave.
New York, NY

32.2 SAE Vehicle Sound Level Committee

Chairman

R. K. Hillquist
Project Manager
Noise and Vibration Laboratory
GM Proving Ground
Milford, MI 48042

32.3 SAE Off-Road Sound Level Committee

Chairman

J. M. Mohr
Director of Research
Outboard Marine Corp.
P. O. Box 663
Milwaukee, WI 53201

33. Steel Door Institute (SDI)

33.1 No active committees at present.

Technical Contact

A. P. Wherry
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1230 Keith Building
Cleveland, OH 44115

34. Woodworking Machinery Manufacturers Association (WMMA)

34.1 No active committees at present.

Technical Contact

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1900 Arch Street
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16. ABSTRACT (*A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.*)

This compilation deals with material assembled from the various standards, industrial and trade organizations, or technical and scientific societies concerned with acoustics. There has been no attempt to review or evaluate the standards, but rather just to list documents covering measurement techniques, calibration methods, definitions, rating schemes, and equipment and product specifications concerned with noise. Those standards dealing solely with ultrasonics, audio equipment, or shock and vibration have not generally been included. The paragraphs describing the standards give a brief summary of intent and/or scope of the standard. In some cases the paragraph is the official description of the standard as issued by the organization or society promulgating the standard, while in others the paragraph merely describes the intent of the standard. Proposed standards are also listed where available. Not listed are proposed revisions of current standards and those which must be reapproved to remain in effect. For the convenience of those readers wishing to purchase copies of standards, names and addresses for the various organizations and/or societies are provided. Federal Regulations directly involving noise measurements are given in Appendix A. Appendix B lists active committees for each organization and names and addresses of appropriate committee chairmen or technical contacts. This compilation includes all information available as of January 1, 1976.

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