An Overview of The ASA Standards Program

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An overview of the standards program of the Acoustical Society of America (ASA) is presented. The American National Standards Institute (ANSI) accreditation and the U.S. voluntary consensus process are described. The structure of the ASA standards organization is explained and the roles of each standards committee are outlined. The standards development process from new work item proposal through final approval is detailed. The relationship between national and international standards bodies is also discussed. Examples of the practical benefits of acoustical standards for both participating organizations and end users are given. Information about how to participate in the standards process is also provided.

A century ago, U.S. standards were primarily developed to support manufacturing and mechanical processes. Today, standards offer benefits to all segments of business and industry, government and consumers. They simplify product development, reduce unnecessary duplication, lower costs, increase productivity, promote safety, and permit interchangeability, compatibility, and interoperability. They help to advance scientific discovery and protect key environmental resources.

In this context, a *standard* is defined as: "A norm, method, procedure, or specification that establishes uniform engineering or technical criteria, processes, or practices to overcome technical barriers." Technical barriers can arise in inter-regional commerce due to differences among regulations developed independently/separately by local entities or when different groups with large user bases come together doing some well-established thing that is mutually incompatible.

U.S. Voluntary Consensus Process

The U.S. standards development system is based on voluntary standards that arise from a formal, coordinated, consensus-based open process. Developed by subject matter experts from both the public and private sectors, the voluntary process is open to all affected parties and relies upon cooperation and compromise among a diverse range of stakeholders. When due process is followed, the resulting standards provide equitable economic benefits to many rather than a select few.[1]

ANSI

ANSI is a non-profit, non-government, private-sector, membership organization that is the coordinator of voluntary standards development in the U.S. ANSI does not develop standards. ANSI accredits standards-developing organizations (SDOs) and approves standards developed by ANSI-accredited SDOs as American National Standards (ANS). It is worth noting that ANSI's approval recognizes that the standard was developed according to the developer's accredited operating procedures. ANSI does not take any position on the technical content of any ANS. ANSI also serves as the U.S. national body representing and coordinating U.S. positions and interests in international standards development in the International Organization for Standardization (ISO) and, via the U.S. National Committee, the International Electrotechnical Commission (IEC). ANSI is the sole U.S. representative and dues-paying member of the ISO, and as a founding member of ISO, ANSI plays an active role in its governance.

ASA

The ASA is an ANSI-accredited SDO. ASA is a professional society that develops standards within its areas of expertise and has an extensive standards development infrastructure in place. They administer the development of and publish ANSI-approved, voluntary consensus standards in the areas of acoustics (ASC S1), mechanical vibration and shock (ASC S2), bioacoustics (ASC S3) including animal bioacoustics (ASC S3/SC 1), and noise (ASC S12). Additionally, working in conjunction with ANSI, the ASA also administers nine U.S. technical advisory groups that provide U.S. stakeholders with access to international standards development in the ISO/IEC.

The ASA Committee on Standards (ASACOS) is the body within ASA that governs policy, financing, and program oversight. A steering committee handles procedural matters. The voting members of ASACOS include: the chairs and vice chairs of each of the standards committees, chairs of the U.S. ISO/IEC technical committee technical advisory group (TAG) for which ASA has responsibility, and representatives from each of the thirteen ASA technical committees. ASACOS meets twice a year, and its primary duties are to oversee the functioning of the secretariat and to formulate plans for financing the standards operation of ASA and make recommendations to the ASA Executive Council.

The standards committees (or S-Committees) are each made up of their members and the secretariat. Committee members include: companies, organizations, trade associations, governmental agencies, or other groups that have identified themselves as having a direct and material interest in the work of the committee. These members have applied for membership in the committee and have paid a participation fee. Organizational members have the opportunity to appoint one or two voting representatives to each committee they join, although each member has only one vote on any action before the committee. Members may propose that their voting representative or other employees or members be considered for participation in working groups.

There are no restrictions on membership aside from having a direct and material interest in the work of the committee and a willingness to participate. Each committee also benefits from the participation of a group of individual experts (IEs). The IEs have no vote; however, they may review documents and provide comments and recommendations to the committee. IEs may also be called upon to advise the committee leadership on technical matters in their area of expertise. Individual experts are nominated by the chair and vice chair of the committee, and their nomination is submitted to the membership for approval. They serve one-year terms and may be reappointed.[2]

Each standards committee establishes working groups (WGs) to draft standards for consideration by the committee. Each WG has a chair appointed by the Standards Committee Chair. In addition to drafting standards or technical reports, WGs may also assist the committee in resolving comments and may make recommendations as to the maintenance of existing standards. Working-group chairs receive notices of documents being balloted by the committee, and their input is solicited although they have no vote. The various working groups are listed in Tables 1-5.

At their discretion, WG chairs may elicit the opinions of their WG members as part of this process. Neither WG chairs nor WG members are required to be members of the committee or ASA, and there is no fee for their participation. They volunteer their time and expertise to develop the work within their scope. WGs may be disbanded by the committee if there is no longer work under their scope. The committee (or subcommittee, if one has been formed by the committee, e.g. S3/SC 1) is the consensus body and the voting group among whom consensus must be achieved.[3]

ASA Standards consists of the aforementioned ANSI-accredited standards committees. Each committee has its own scope. ASC S3 also has a subcommittee on animal bioacoustics. Tables 1 through

Based on a paper presented at Inter-Noise 2015, 44th International Congress on Noise Control Engineering, San Francisco, CA, August, 2015.

5 list the names and focus areas of the working groups within each committee, indicating the types of standards each working group develops.

Currently, ASA also administers the U.S. technical advisory groups (TAGs) to several ISO/IEC technical committees and subcommittees:

- IEC Technical Committee 29, Electroacoustics
- ISO Technical Committee 43, Acoustics
- ISO Technical Committee 43/SC 1, Noise
- ISO Technical Committee 43/SC 3, Underwater acoustics
- ISO Technical Committee 108, Mechanical vibration, shock and condition monitoring
- ISO Technical Committee 108/SC 2, Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures
- ISO Technical Committee 108/SC 3, Use and calibration of vibration and shock measuring instruments
- ISO Technical Committee 108/SC 4, Human exposure to mechanical vibration and shock
- ISO Technical Committee 108/SC 5, Condition monitoring and diagnostics of machine systems.

TAGs to IEC committees operate under USNC approved procedures. TAGs to ISO committees are accredited by ANSI.[4,5,6,7]

In addition, ASA also administers three ISO secretariats:

- ISO Technical Committee 108, Mechanical vibration, shock and condition monitoring
- ISO Technical Committee 108/SC 5, Condition monitoring and diagnostics of machine systems (to be relinquished effective 2016)
- ISO Technical Committee 43/SC 3, Underwater acoustics

A schematic diagram of the ASA standards program is shown in Figure 1.

Table 1. ASC S1 – Acoustics Working Groups.

S1/WG01	Standard Microphones and their Calibration
S1/WG04	Measurement of Sound Pressure Levels in Air
S1/WG05	Band Filter Sets
S1/WG07	Personal Noise Dosimeters
S1/WG15	Noise Canceling Microphones
S1/WG17	Sound Level Meters and Integrating Sound Level Meters
S1/WG19	Characterization of Windscreen Acoustical Performance
S1/WG20	Ground Impedance and Attenuation of Sound due to the Ground
S1/WG29	Preferred Frequencies, Frequency Levels, and Band Numbers for Acoustical Measurements
S1/WG30	Reference Quantities

Table 2. ASC S2 – Mechanical Vibration and Shock Working Groups.

S2/WG02	Terminology and Nomenclature in the Field of Mechanical Vibration and Shock and Condition Monitoring and Diagnostics of Machines
S2/WG04	Characterization of the Dynamic Mechanical Properties of Viscoelastic Polymers
S2/WG05	Use and Calibration of Vibration and Shock Measuring Instruments
S2/WG07	Acquisition of Mechanical Vibration and Shock Measurement Data
S2/WG08	Analysis Methods of Structural Dynamics
S2/WG09	Training and Accreditation
S2/WG10	Operational Monitoring and Condition Evaluation
S2/WG11	Measurement and Evaluation of Mechanical Vibration of Vehicles
S2/WG12	Measurement and Evaluation of Structures and Structural Systems for Assessment and Condition Monitoring
S2/WG14	Prediction of Ground-Borne Noise and Vibration from Rail Transportation Systems
S2/WG15	Shaft Alignment Methodology
S2/WG16	Auxiliary Equipment for Shock and Vibration Measurements
S2/WG39	Human Exposure to Mechanical Vibration and Shock (joint with S3)
S2/WG54	Atmospheric Blast Effects

Table 3. ASC S3 – Bioacoustics Working Groups.

S3/WG35	Audiometric Equipment
S3/WG36	Subjective Speech Intelligibility Testing
S3/WG37	Couplers, Ear Simulators, and Earphones
S3/WG48	Hearing Aid Measurement
S3/WG51	Auditory Magnitudes (Loudness)
S3/WG56	Criteria for Background Noise for Audiometric Testing
S3/WG58	Hearing Conservation Criteria
S3/WG62	Impulse Noise with Respect to Hearing Hazard
S3/WG67	Manikins
S3/WG72	Measurement of Auditory Evoked Potentials
S3/WG73	Bioacoustical Terminology
S3/WG79	Methods for Calculation of the Speech Intelligibility Index
S3/WG81	Hearing Assistance Technologies
S3/WG83	Sound Field Audiometry
S3/WG84	Otoacoustic Emissions
S3/WG88	Audible Emergency Evacuation Signals
S3/WG91	Text-to-Speech Synthesis Systems

ASA Standards Development Process

Before a standard is developed it is important to determine whether or not there is a market need for that standard. Standards

Table 4. ASC S3/SC1 – Animal Bioacoustics Working Groups.

S3/SC1 WG03	Underwater Passive Acoustic Monitoring by Towed Array Systems for Bio-acoustic Applications
S3/SC1 WG04	Description and Measurement of the Ambient Sound in Parks, Wilderness Areas, and Other Quiet and/or Pristine Areas
S3/SC1 WG05	Noise and Vibration in Animal Laboratory Facilities
S3/SC1 WG06	Auditory Evoked Potential Testing of Toothed Whale Hearing

Table 5. ASC S12 – Noise Working Groups.

S12/WG03	Measurement of Noise from Information Technology and Telecommunications Equipment
S12/WG11	Hearing Protector Attenuation and Performance
S12/WG15	Measurement and Evaluation of Outdoor Community Noise
S12/WG18	Criteria for Room Noise
S12/WG23	Determination of Sound Power
S12/WG27	Procedures for Outdoor Measurement of Sound Pressure Level
S12/WG32	Methods for Measurement of Impulse Noise
S12/WG38	Noise Labeling In Products
S12/WG40	Measurement of the Noise Aboard Ships
S12/WG41	Model Community Noise Ordinances
S12/WG43	Rating Noise with Respect to Speech Interference
S12/WG44	Speech Privacy
S12/WG47	Underwater Noise Measurements of Ships
S12/WG49	Noise from hand-operated power tools, excluding pneumatic tools
S12/WG50	Information Technology (IT) Equipment in Classrooms
S12/WG52	Classroom Acoustics
S12/WG53	High Performance Aircraft Noise Measurement
S12/WG54	Measurement of Low Frequency Sound
S12/WG55	Guidelines for the Specification of Noise Emission of Machinery
S12/WG56	Assessing Visitor Response to Noise at Parks
S12/L1	Noise Emitted by Rotating Electrical Machines (liaison to ISO/TC 43/SC1/WG13)
S12/L2	Measurement of Noise from Pneumatic Compressors Tools and Machines (liaison to ISO/TC 43/SC1/WG9)
S12/L3	Measurement and Evaluation of Motor Vehicle Noise (liaison to ISO/TC 43/SC1/WG8)
S12/L4	Measurement and Evaluation of Aircraft Noise (liaison to SAE Committee A-21)
S12/L5	Environmental Acoustics (liaison to ASTM E-33)
S12/L6	Construction-Agricultural Sound Level (liaison to SAE)
S12/L7	Specialized Vehicle and Equipment Sound Level (liaison to SAE)
S12/L8	Measurement of Industrial Sound (liaison to ASME PTC 36)

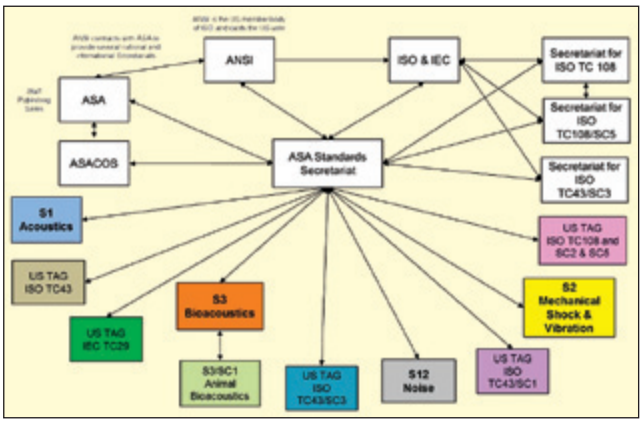

Figure 1. Groups and subgroups comprising the ASA standards program.

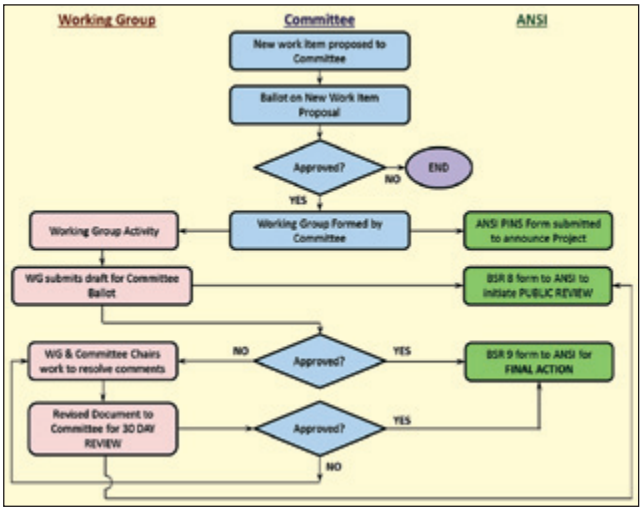

Figure 2. Standards development process from new work item proposal through final approval.

are typically developed to address specific needs identified by the technical community and for a wide variety of reasons: health, safety, security or environmental concerns; technical issues; quality or compatibility requirements; or to provide a basis for governmental regulation. A new standard may be required for a new technology or to reflect a change in technology.

The typical standard-development process begins with a New Work Item Proposal, which is then balloted. If approved, the project is allocated to a working group (WG), or a new WG is formed. ASA files a Project Initiation Notification System form (PINS) with ANSI for any new standard or revision project. This is part of the effort to assess if a new standard is needed or if a standard already exists that can be adopted or revised. Comments received as a result of the PINS publication must be addressed.

Working groups develop draft standards that are submitted to the ASC for vote, comment, and ultimately for approval. The draft is then balloted by the S-Committee. During this time, a 45-day public comment period is conducted. Negative votes require comments – in general, what specific changes are required to reverse the negative vote. In the event of negative votes or public comments, the WG chair works to resolve these to produce a new draft for re-ballot. Once again, there is a 45-day period for public review and comment.

The goal is to develop consensus for all published standards. This is much more than a plurality; the minimum requirement for approval is agreement of 80% of the votes received, but ASA strives for approval by 90% or more. Once approved by the ASC, the secretary submits evidence that the standard was developed according to the ASC's accredited operating procedures to ANSI for its approval to identify the standard as an "American National Standard." All published standards are subject to a five-year review, when they are either revised, reaffirmed without change, or withdrawn using the same voting process. This process is shown in Figure 2.

National and International Standards

A national standard is either written by or adopted by a national standards body. Standards developed by ASA are submitted to ANSI for approval as an American national standard. Because of the increasingly global marketplace, ASA also considers the adoption of international standards as American national standards, or a nationally adopted international standard (NAIS).[8] For some projects, the ASA working group or standards committee may also examine the feasibility of having the American national standard accepted as an international standard.

What's in It for Me and My Organization?

Using standards allows companies to manufacture and test faster, better, and less expensively. Industry-wide agreements published as standards enable economies of scale and reduce the demand for internal resources to develop proprietary procedures. Companies justify their participation in standards development by the economic benefits to the organization. A proposed standard may help expand or create a new market. It may also reduce costs. Participation in standards work should be a part of a company's strategic priorities. Failure to participate is a risk that may put the company at a competitive disadvantage.[9]

Successful businesses benefit from standards by actively participating in the standardization process and by using standards as strategic marketing instruments. Strategic standardization leverages standards to build and sustain a competitive edge. The key element of strategic standardization is to involve company representatives in standards-developing committees and working groups to ensure that adopted standards in the industry represent the organization's strategic interests for important products in emerging markets. A company that chooses not to participate in standards development is choosing to allow its competitors to write the standards to which it will need to conform in order to remain competitive.

Active participation by an industry representative in developing a voluntary standard typically involves technical analyses and developing cooperation and collaboration with other committee representatives. This is accomplished by actively attending standards committee meetings comprising subject matter experts and by proposing, commenting and voting on draft standards. It also includes "virtual" work that occurs outside of formal meetings such as electronic sharing of documents. Participants can also easily follow the progress of other related standards, proposals for new standards, and revisions, reaffirmations and withdrawals of existing standards.

All concerned stakeholders, in particular government authorities, need to determine if a proposed standard has health or safety implications. The involvement of a broad range of stakeholders is critical to the successful development of standards. Representative groups, such as government, companies, or individuals, must have a sufficient need for the standard to help prepare it. A standard that meets the needs of eventual users is always superior to one that reflects only one point of view.

Just a few recent examples of acoustical standards and their benefits include:

- S1.1 to enable correct and consistent acoustical terminology and use in technical documents
- S1.4 to ensure accurate sound level meter measurements and data compatibility
- S1.15 for calibration integrity and interoperability of measurement microphones
- S3.22 to ensure quality and FDA compliance of hearing aids
- S12.10 to measure and reduce the noise levels of home appliances and office machines
- S12.42 to quantify the performance of hearing protectors
- S12.60 to improve classroom acoustics

This list is necessarily incomplete, as new acoustical standards are published every month.

Companies or organizations may become members of an Accredited Standards Committee and/or one of the U.S. technical advisory groups. The current fee schedule is available from the

ASA standards office or the ASA standards website. Anyone with a material interest in the scope or subject matter may join a working group. Information about ASA Standards can be found bu visiting: http://acousticalsociety.org/standards/introduction_to_asa_standards_program.

You can also contact the ASA standards manager at asastds@acousticalsociety.org. Finally, and perhaps most importantly, are the end users of acoustical standards. All ASA-developed standards are available for purchase at the on-line store: https://global.ihs.com/home_page_asa.cfm?&rid=ASA. Comments from users are welcome and should be submitted to the standards manager at the e-mail address above.

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