

Standards Program of the Acoustical Society of America

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Introduction

The Acoustical Society of America (ASA) has been involved in standards since 1932, shortly after the inception of the Society itself. At that time, standards were primarily developed to support manufacturing and mechanical processes. Today, acoustical standards help advance scientific discovery, simplify product development, reduce unnecessary duplication of effort, increase productivity and lower costs, and permit interoperability and compatibility. They also promote safety and protect key environmental resources. Standards are the embodiment of practical applications of acoustics and, as such, are at the core of the mission of the Society (Embleton et al., 2004). A historical timeline of the ASA Standards Program, highlighting significant events, is shown in **Figure 1**. Note that in 1992, the ASA Standards Program was ranked 3rd out of 42 standards programs in the Council of Engineering and Scientific Society Executives (CESSE) survey.

- **1932:** ASA becomes the sponsor of Committee Z24 – Acoustical Measurement and Terminology
- **1942:** Scope of Z24 Committee expanded to include Vibration
- **1949:** Publication of first standards:
Z24.3 – “Specification for laboratory standard microphones” & Z24.9 – “Method for coupler calibration of earphones”
- **1954:** Landmark publication of Z24-X-2 “The Relations of Hearing Loss to Noise Exposure”
- **1957:** Z24 split into 3 committees:
S1 - Acoustics S2 - Mechanical Vibration and Shock S3 - Bioacoustics
- **1962:** “The Effects of Shock and Vibration on Man” published through S3, which provided the basis for standards in bioacoustics and noise
- **1969:** ASA takes over the secretariats for S1, S2, and S3 from USA Standards Institute (now ANSI)
- **1971:** ASA takes over the secretariats of ISO TC 108 – Mechanical vibration, shock and condition monitoring and ISO TC 108/SC1 – Balancing
- **1978:** ASA Executive Council appoints first Standards Director: *Henning von Gierke*
- **1981:** New ASA committee developed from S1 and S3: S12 - Noise
- **1992:** ASA ranks 3rd of 42 national Standards Development Organizations in CESSE survey
- **1993:** New ISO subcommittee formed with ASA as Secretariat:
ISO TC108/SC5 - Condition monitoring and diagnostics of machine systems
- **2007:** New ASA subcommittee formed: S3/SC1 Animal Bioacoustics
- **2011:** New ISO subcommittee formed with USA (ASA Standards) as Secretariat:
ISO TC43/SC3 Underwater Acoustics
- **Present Day:** The ASA Standards program comprises **3** international secretariats, **84** Organizational Members, **4** committees and **1** subcommittee, with over **80** Working Groups and over **550** volunteer WG members that publish and maintain over **120** standards!

Figure 1. Historical timeline and key events of the Acoustical Society of America (ASA) Standards Program. See text for abbreviations.

Three primary sources of funding support the ASA Standards Program. Two sources, sales of standards and organizational membership fees, cover approximately 75% of costs. The remainder is made up by a subsidy from the ASA.

The American National Standards Institute and the Voluntary Consensus Process

The American National Standards Institute (ANSI) is a nonprofit, nongovernment, private sector membership organization that is the coordinator of voluntary standards development in the United States. ANSI does not develop standards,

but, rather, it accredits standards developing organizations (SDOs) and approves standards developed by these SDOs as American National Standards (ANS). ANSI also serves as the US national body, representing and coordinating US positions and interests in international standards development to the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). More information is available at <https://www.ansi.org/>.

The US standards development system is based on voluntary standards developed by subject matter experts in a formal, open, consensus-based process. The voluntary consensus process is open to all affected parties from both the public and private sectors and relies on cooperation and compromise among a diverse range of stakeholders. Because due process is followed, the resulting standards yield equitable benefits to many rather than to a select few (American National Standards Institute, 2016).

ASA Standards

ASA Standards is an ANSI-accredited SDO that develops standards in acoustics. ASA Standards administers the development of and publishes ANSI-approved, voluntary consensus standards. For international standards liaison, ASA Standards also administers Technical Advisory Groups (TAGs) to the ISO and IEC that provide US stakeholders with access to international standards development. A diagram of the ASA Standards Program is shown in Figure 2.

The ASA Committee on Standards (ASACOS) is the body within ASA that governs policy, financing, and program oversight. It is chaired by the standards director and meets twice a year. Its principal responsibilities are to make recommendations to the ASA Executive Council regarding the Standards Program and its financing, operation, and appointments and to oversee the functioning of the Secretariat, which is the group responsible for oversight and organization of all operational standards activities. For the ASA, this role is fulfilled by the standards manager.

The ASACOS Steering Committee handles procedural matters. The chairs and vice chairs of the standards committees

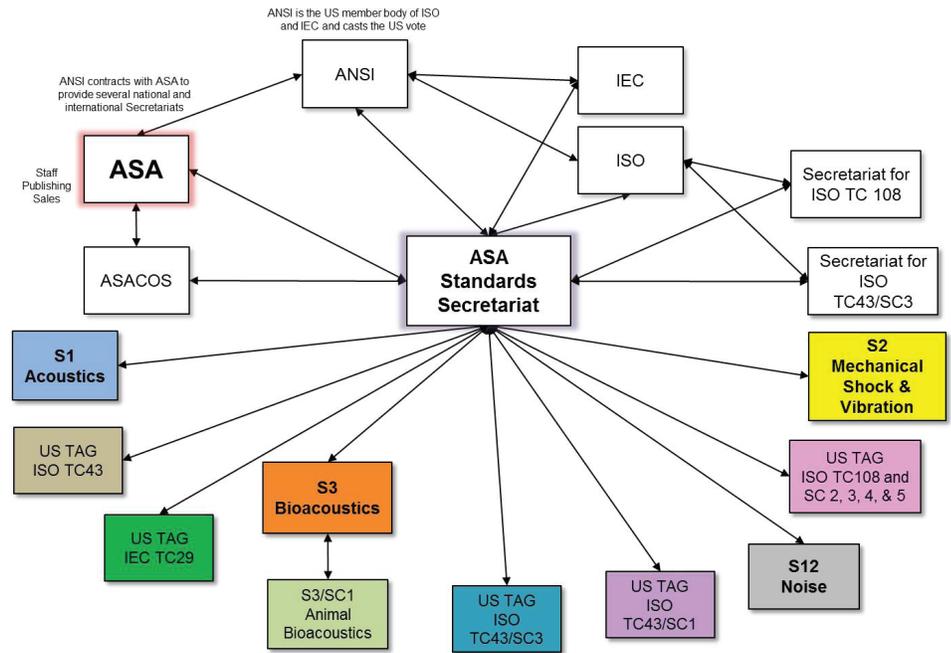


Figure 2. Groups and subgroups comprising the ASA Standards Program. See text for abbreviations.

(see below), the chairs of the US ISO/IEC TAGs, and representatives from each of the 13 ASA technical committees (TCs) are all voting members of ASACOS.

Currently, the ASA has four standards committees in the areas of noise (ASC S12), acoustics (ASC S1), mechanical vibration and shock (ASC S2), and bioacoustics (ASC S3, which also includes a subcommittee on animal bioacoustics (ASC S3/SC 1).

The organizational members of the standards committees are companies, organizations, trade associations, governmental agencies, or other groups that have identified themselves as having a direct and material interest in the work of a particular committee. These entities apply for membership in the committee and pay an annual participation fee. The organizational members can appoint a voting representative to each committee they join. There are no restrictions on membership aside from direct and material interest in the work of the committee and the willingness to participate. Current ASA Standards member organizations are listed on the ASA Standards website available at <http://acousticstoday.org/smembers>.

Working groups (WGs) within each committee draft standards and technical reports, make recommendations regarding the maintenance of existing standards, and assist in resolving comments on draft standards documents. WG members are not required to be members of the committee or the ASA, and there is no fee to participate. WG members volunteer their time and expertise to develop standards within their scope.

WG chairs are appointed by the standards committee chair. 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 for approval of a standard. The current roster of working groups can be viewed at <https://asastandards.org/>.

The info page for each WG contains an email link to contact the chair.

Participation in standards development provides the opportunity to be involved in developing the very standards that impact one's own research or job. Information about becoming an ASA Standards organizational member or about joining a WG is available on the website at <http://acousticalsociety.org/standards>. Those interested in participating in standards development should contact the WG chair or the ASA Standards office at asastds@acousticalsociety.org.

Individual experts (IEs) within each committee review documents and provide comments and recommendations to the committee in their area of expertise. Although they have no vote, IEs are nominated by the chair and vice chair of the committee and their nomination is submitted to ASACOS and ASA Executive Council for approval. They serve one-year terms and may be reappointed.

Each of the aforementioned standards committees is composed of its organizational members, the WG members, and the secretariat (Struck, 2015).

The Standards Development Process

Standards 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 process begins with a New Work Item Proposal. This may be generated by anyone with a material interest in the subject matter willing to volunteer to work on this project but most often comes from within an existing WG. If approved by the committee, the project is allocated by the Secretariat to a WG or a new WG is formed. ASA then files a Project Initiation Notification System (PINS) form with the 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. Any public comments received as a result of the ANSI PINS publication must be addressed.

WGs develop draft standards that are submitted to the ASC for comment, vote, and approval. The draft is then balloted by the standards committee. During this time, there is a 45-day public comment period. For a detailed discussion of the voting process, see the ANSI (2016) requirements. Negative votes require comments on the specific changes the commenter would expect in order to reverse their negative vote. In the event of negative votes or public comments, the WG chair works to resolve these in order to produce a new draft. Any changes are reballoted, with an additional 30-day period for public review and comment, including voting. The goal is to develop a 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 the 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 accredited operating procedures of the ASC to the ANSI for its approval to identify the standard as an "American National Standard." All published standards are subject to a 5-year review, when they are either revised, reaffirmed without change, or withdrawn using the same voting process (Blaeser, 2015).

International Standards

Because of the increasingly global marketplace, the ASA also considers the adoption of international standards as US Nationally Adopted International Standards (NAIS). For some projects, the ASA WG and/or the standards committee may also examine the feasibility of proposing an American National Standard as an international standard. If accepted by the corresponding international committee, the proposed US standard is advanced through the international consensus process, similar to the ANSI process but with international member delegates from each member country participating.

In conjunction with the ANSI, the ASA also administers nine US TAGs in the ISO and IEC.

- 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 US National Committee-approved procedures. TAGs to ISO committees are accredited by ANSI (Struck, 2016). International technical committees operate in a similar consensus-based manner, but their membership is composed of international delegates from many nations. Committees generally meet every 18 months. The working language for the meetings is English.

ASA Standards also administers the secretariats for two ISO technical committees.

- ISO Technical Committee 108: Mechanical vibration, shock, and condition monitoring
- ISO Technical Committee 43/SC 3: Underwater acoustics

The secretariat handles all administration and coordination of the committee. Holding a secretariat for an international committee is an immense responsibility that requires diligence, diplomacy, and patience. For these reasons, holding an international secretariat is an honor and a privilege that enhances the prestige of the United States and of the ASA Standards Program.

Participation in Standards Development

The involvement of a broad range of stakeholders is critical to the successful development of standards. Representatives from groups such as companies, educational institutions, and trade associations as well as individual consultants and retired or semiretired engineers and scientists actively participate in the standards development process. Other concerned stakeholders, in particular government authorities, are often involved to determine if a proposed standard has health or safety implications. A standard developed by a diverse range of stakeholders that meets the needs of the eventual end users is always superior to one that reflects only one point of view.

Anyone with a material interest in the scope or subject matter may join a WG. Participation in the development of a voluntary standard typically involves technical analyses and

drafting and reviewing text and references in collaboration with other WG members. WG meetings may occur in person or using online collaboration tools. There may also be work that occurs outside the formal meetings such as the electronic sharing of documents. Representatives of member organizations and ASACOS members attend standards committee meetings and actively participate by proposing, commenting, and voting on draft standards. Participants can follow the progress of related standards and proposals for new standards as well as revisions, reaffirmations, and withdrawals of existing standards. It is also an opportunity to network and exchange technical knowledge with one's peers and counterparts.

ASA Standards member organizations justify their participation in standards development by the economic benefits to their business or trade association. Strategic standardization leverages standards to build and sustain a competitive edge. Companies that do not participate in standards development allow their competitors to define the standards to which they will need to conform in order to remain competitive in the marketplace. Industry-wide agreements published as standards enable economies of scale and reduce the demand for internal resources to develop proprietary procedures. A new standard may help expand or create a new market. Using standards also enables companies to manufacture and test more efficiently and at a reduced cost (Struck, 2015).

Conclusion

The purpose of the ASA Standards Program is to generate and maintain voluntary consensus-based standards in acoustics. Recent examples of the ASA-developed acoustical standards and their benefits include S1.1 and S3.20 to enable correct and consistent acoustical and bioacoustical terminology usage in technical documents. A free, searchable, online database of these terms can be found on the ASA website at <http://acousticstoday.org/terminology>.

- S1.4 to ensure accurate sound level meter measurements
- S1.6 to ensure standard frequency formats and data compatibility
- S3.7 for the measurement and calibration of earphones
- S3.22 to ensure quality and Federal Drug Administration 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 because new acoustical standards are published every month. These and all other ASA-developed standards are available for purchase at the online standards store available at <http://acousticstoday.org/sstore>. ASA Standards provides a benefit of five free standards downloads per year to ASA members.

ASA Standards cover a wide range of applications in acoustics across all of the technical specialties of the Society. Volunteers contributing their time and expertise are at the core of the program. Anyone with a material interest in the subject matter is encouraged to participate. Contact the ASA Standards office for more information at asastds@acousticalsociety.org.

Biosketch



Christopher J. Struck is the Standards Director of the Acoustical Society of America (ASA) and the CEO of CJS Labs in San Francisco. His 30 years in industry include measurement instruments for Brüel & Kjær, Denmark; hearing instruments at GN ReSound; technology licensing at Dolby Laboratories; and loudspeakers at Tympany Corporation. He is a member of the ASA, fellow and former governor of the Audio Engineering Society (AES), senior member of the IEEE, member of the Society of Motion Pictures and Television Engineers (SMPTE), and member of the Institute of Noise Control Engineering (INCE). He is a member of the IEEE Working Group on Communication Electroacoustics and the AES SC-4-3 Working Group on Loudspeaker Modeling and Measurement.

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