THE ACOUSTICAL SOCIETY OF AMERICA STANDARDS PROGRAM: ORGANIZATION AND SCOPE

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Introduction

The standards program of the Acoustical Society of America (ASA) is fundamental to the Society and directly serves its stated purpose—to increase and diffuse the knowledge of acoustics and promote its practical applications. Standards are one of the foremost ways that the society accomplishes its purpose of promoting the practical application of acoustics.

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Since the inception of the society in 1929, members have been actively involved in the development of acoustical standards. The very first standards work began in 1930 and dealt with standardizing a sound level meter and its use. For those of you who know him, Bob Young was there and making his ideas known. So the society has an 82-year history of acoustical standards development.

Naturally, over these 82 years, the standards program has taken on various different shapes and forms. At an age of 82, it predates the International Organization for Standardization (ISO) and the American National Standards Institute (ANSI). This paper describes the current program, its makeup, and operation.

Standards program organization

There are four constituent parts to the standards program organization. The governance of the standards program is by the Acoustical Society of America's Committee on Standards (ASACOS), and there are 3 operating elements under ASACOS. First, there are the committees that develop the American National Standards. These committees are accredited by ANSI, and are termed accredited standards committees (ASCs). National Standards developed by these committees are given the designation ANSI/ASA and are copyrighted by the ASA. Second, there are the ISO/IEC Technical Advisory Groups (TAGs). These TAGs provide the United States' input to the development of ISO and IEC standards. Third, there are ISO secretariats. These secretariats provide the management and operation of ISO committees or subcommittees.

There are four ASCs and one subcommittee that develop American National Standards under the umbrella of ANSI. These are the so-called "S" committees. There is S1, Acoustics; S2, Mechanical Vibration and Shock; S3, Bioacoustics; S12, Noise; and the relatively recent addition of S3/Subcommittee 1, Animal Bioacoustics.

The "S" committees

S1, Acoustics, develops standards with such topics as acoustical terminology, sound level meters, filters, noise dosimeters, etc. The scope of ASC S1 is:

> Standards, specifications, methods of measurement and test, and terminology in the field of physical acoustics including architectural acoustics, electroacoustics, sonics and ultrasonics, and underwater sound, but excluding those aspects which pertain to biological safety, tolerances and comfort.

S2, Mechanical Vibration and Shock, develops standards with such topics as calibration of shock and vibration transducers, vibration of buildings, and human vibration thresholds, etc. The scope of ASC S2 is:

> Standards, specifications, methods of measurement and test, and terminology in the field of mechanical vibration and shock, and condition monitoring and diagnostics of machines, including the effects of exposure to mechanical vibration and shock on humans, including those aspects which pertain to biological safety, tolerance and comfort.

S3, Bioacoustics, develops standards with such topics as speech interference levels, articulation index, and specification of hearing aids, etc. The scope of ASC S3 is:

> Standards, specifications, methods of measurement and test, and terminology in the fields of psychological and physiological acoustics, including aspects of general acoustics, which pertain to biological safety, tolerance and comfort.

A few years ago, Subcommittee 1, Animal Bioacoustics, was added under ASC S3. ASC S3/SC 1 is planning to develop standards with such topics as measuring ambient noise in low-noise situations such as parks and wilderness areas, underwater passive acoustic monitoring for bioacoustic applications, noise and vibration in animal laboratory facilities, etc. The scope of S3/SC 1 is:

> Standards, specifications, methods of measurement and test, instrumentation and terminology in the field of psychological and physiological acoustics, including aspects of general acoustics, which pertain to biological safety, tolerance and comfort of non-human animals, including both risk to individual animals and to the long-term via-

bility of populations. Animals to be covered may potentially include commercially-grown food animals; animals harvested for food in the wild; pets; laboratory animals; exotic species in zoos, oceanaria or aquariums; or free-ranging wild animals.

S12, Noise, is the youngest of our S committees, with an age of about 30 years. S12 develops standards with such topics as environmental noise measurement and assessment, measurement of sound power, measurement of hearing protectors, etc. The scope of ASC S12 is:

Standards, specifications, and terminology in the field of acoustical noise pertaining to methods of measurement, evaluation, and control; including biological safety, tolerance and comfort, and physical acoustics as related to environmental and occupational noise.

The TAGs

The standards program currently administers 9 TAGs corresponding to the 9 ISO/IEC committees or subcommittees in which we participate. First, we participate in ISO/TC 108, Mechanical vibration, shock and condition monitoring, and in 4 of its subcommittees, for a total of 5 TAGs. Second, we participate in ISO/TC 43, Acoustics, and 2 of its subcommittees, for a total of 3 TAGs. Finally, we participate in IEC/TC 29, Electroacoustics. Table 1 lists these 9 TAGs. The scopes for the Technical Committees and the Subcommittees that have their own scopes follow.

The scope of ISO TC 29 is:
To prepare International Standards related to instrumentation and methods of measurements in the field of electroacoustics.

Excluded from the scope are:

- standards for sound and video recording as dealt with by TC 100;
- standards for equipment in the field of audio and audiovisual engineering as dealt with by TC 100;
- standards and terminology for ultrasonic techniques dealt with by TC 87.

The scope of ISO TC 43 is:
Standardization in the field of acoustics, including methods of measuring acoustical phenomena, their generation, transmission and reception, and all aspects of their effects on man and his environment. Excluded: electroacoustics and the implementation of specifications of the characteristics of measuring instruments for acoustic purposes.

The scope of ISO TC 108 is:
Standardization in the fields of mechanical vibration and shock and the effects of vibration and shock on humans, machines, vehicles (air, sea, land and rail) and stationary structures, and of the condition monitoring of machines and structures, using multidisciplinary approaches.

Specific areas of current interest include the standardization of:

- terminology and nomenclature in the fields of mechanical vibration, mechanical shock and condition monitoring;
- measurement, analysis and evaluation of vibration and shock, e.g., signal processing methods, structural dynamics analysis methods, transducer and vibration generator calibration methods, etc.;

Table 1

U.S. TAGS administered and organized by ASA	TAG Committees	Associated "S" committees
Electroacoustics	(IEC/TC 29)	S1 and S3
Acoustics	(ISO/TC 43)	S1 and S3
Noise	(ISO/TC 43/SC 1)	S12
Mechanical vibration, shock and condition monitoring	(ISO/TC 108)	S2
Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures	(ISO/TC 108/SC 2)	S2
Use and calibration of vibration and shock measuring instruments	(ISO/TC 108/SC 3)	S2
Human exposure to mechanical vibration and shock	(ISO/TC 108/SC 4)	S2
Condition monitoring and diagnostics of machines	(ISO/TC 108/SC 5)	S2
Underwater acoustics	(ISO/TC 43/SC 3)	S1, S12, and S3/SC1

- active and passive control methods for vibration and shock, e.g., balancing of machines, isolation, and damping;
- evaluation of the effects of vibration and shock on humans, machines, vehicles (air, sea, land, and rail), stationary structures and sensitive equipment;
- vibration and shock measuring instrumentation, e.g., transducers, vibration generators, signal conditioners, signal analysis instrumentation, and signal acquisition systems;
- measurement methods, instrumentation, data acquisition, processing, presentation, analysis, diagnostics and prognostics, using all measurement variables required for the condition monitoring of machines;
- training and certification of personnel in relevant areas.

The scope of ISO TC 108/SC 5 is:
Standardization of the procedures, processes and equipment requirements uniquely related to the technical activity of condition monitoring and diagnostics of machines in which selected physical parameters associated with an operating machine are periodically or continuously sensed, measured and recorded for the interim purpose of reducing, analyzing, comparing and displaying the data and information so obtained and for the ultimate purpose of using this interim result to support decisions related to the operation and maintenance of the machine.

The scope of ISO TC 43/SC 3 is:
Standardization in the field of underwater acoustics, (including both natural and anthropogenic sound), including methods of measurement and assessment of the generation and propagation of underwater sound and its reflection and scattering in the underwater environment including the seabed and sea surface, and also including all aspects of the effects of underwater sound on marine life and environment.

The ISO secretariats

The standards program operates 3 secretariats on behalf of ANSI for ISO. These secretariats are ISO/TC 108, Mechanical vibration, shock and condition monitoring, TC 108/SC 5, Condition monitoring and diagnostics of machines, and the newly formed TC 43/SC 3, Underwater acoustics. In ISO, the Secretariat nominates the committee or subcommittee chair (George Frisk will be nominated to be the first chair for TC 43/SC 3). This new ISO subcommittee will provide the vehicle for much greater participation in standards by several of the ASA TCs that heretofore have not been greatly involved in standards. These TCs clearly include underwater acoustics, animal bioacoustics, and acoustical oceanography.

Operation of the S committees

Figure 1 illustrates the component parts to the structure of an S committee or subcommittee. The committee includes

Fig. 1. Committee/subcommittee organization.

a chair, a vice chair, voting member organizations, and individual experts. Note that the memberships of these committees are organizations with a direct and material interest in the subject matter of that committee. Organizations include large manufacturers such as John Deere and GM, industry groups such as the Air-conditioning, Heating, and Refrigeration Institute (AHRI), professional societies such as the American Speech-Language-Hearing Association (ASHA), government laboratories and regulatory bodies, universities, consultants, and consumer advocates, etc. These are the organizations that vote. They accomplish their participation by appointing a representative and an alternate to the committee or subcommittee, and these appointed representatives cast their vote and otherwise participate on behalf of the organizations that they represent. Individual experts and others are able to comment on documents, but, ultimately, it is the vote of the membership that determines the outcome of a ballot.

The committee is assisted in its operation by various groups. Primary are the working groups which perform the basic work in drafting and revising standards. Working groups are made up of a chair, sometimes a vice chair or co-chair, and a group of technical experts. The working group drafts the standard, but they do not vote on the result. All voting is done by the committee.

Figure 2 illustrates the ANSI standards development process that is used in our S committees. Some of the important points to note are the ballots and the process that surrounds them. The first ballot is for approval of a proposed new work effort. If successful, the new work effort is allocated to an existing WG or to a new WG. The WG develops a draft document, and when the working group chair feels that the document is sufficiently complete, it is transmitted to the committee chair for ballot. If the S committee chair and vice chair concur, the draft standard goes to the membership of the committee for ballot. If during the ballot, there are negative positions by members, experts or others participating in the review, it is the job of the working group chair, sometimes assisted by the working group membership and others, to attempt to resolve the negative positions.

Changes to a draft standard based on valid comments can range from virtually none to very extensive. This great range of changes leads to 3 possible outcomes from ballot. It can be that there are no substantive negative positions. In

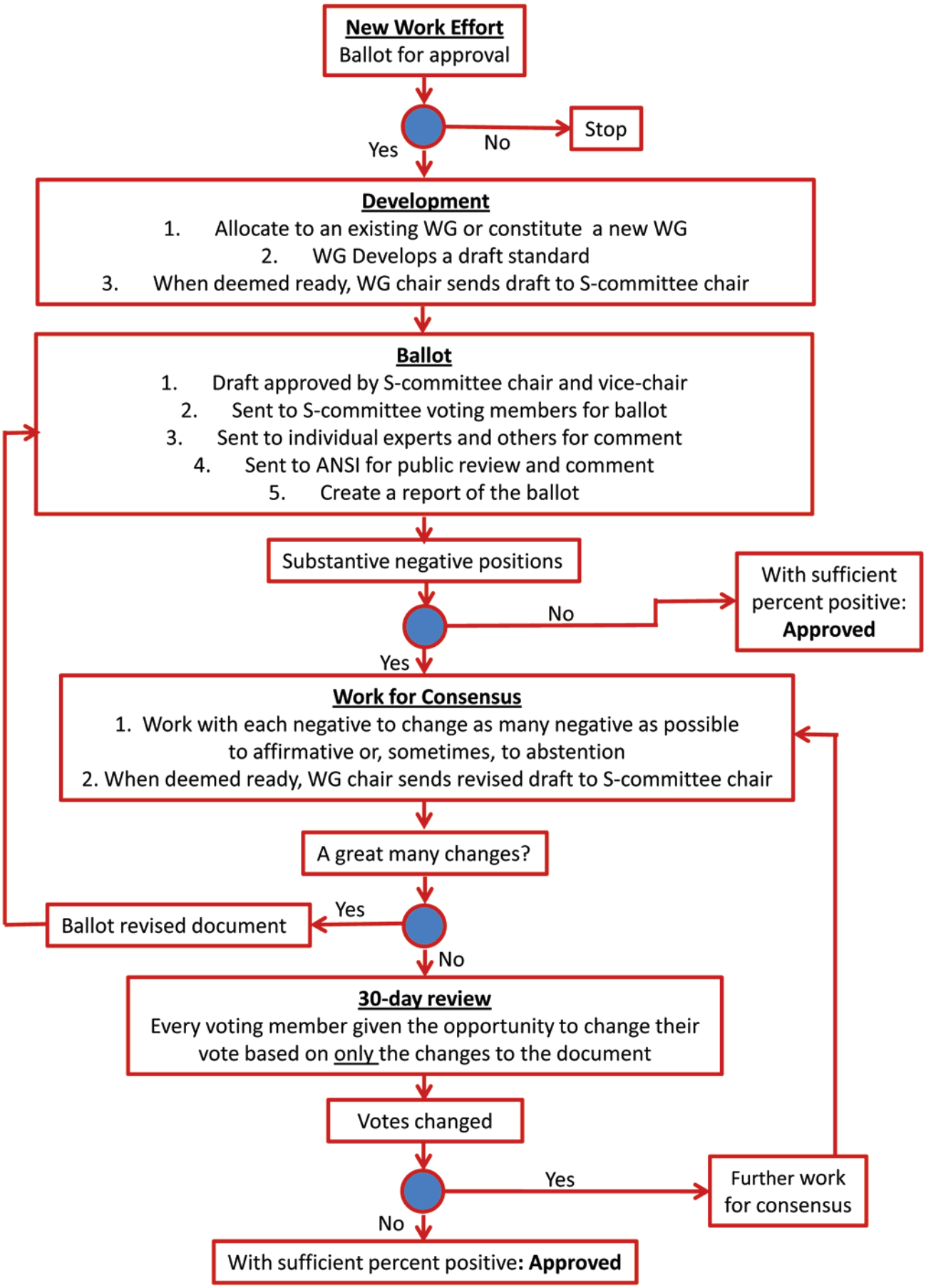

Fig. 2. Detailed standards creation process.

this case the standard is approved as-is with possible editorial corrections. It can be that there are several technical changes that are agreed upon in order to reverse negative positions. In this case, a 30-day review of the suggested changes is conducted. During this 30-day review any member can reverse the positive position based on the changes made. This can lead to more changes and another 30-day review. Sometimes the technical changes are so great that the draft standard is a substantially new document, and a new ballot is conducted.

At about the same time that the ballot is taking place within the S committee, the draft standard is put forward by ANSI for public review and comment. Rarely are such comments received but a response must be made and accommodations as deemed necessary.

The goal is to develop a consensus. A consensus is much more than a plurality. In the case of the standards developed by the ASA, our procedures mandate 80% or greater concurrence, but we strive for, and often achieve, 100% in favor of the standard.

To keep standards up to date and relevant there is also a five-year review and reaffirmation process. Basically, the committee membership is called upon to review the document and to vote as to whether the document should be reaffirmed as is, revised, or rescinded.

The primary documents developed by an S committee are American National Standards. In recent years, there are increasing numbers of nationally adopted international standards (NAIS). When a technical area is too new or controversial for standardization, or a standard is otherwise impractical, there is the option of developing a technical report using the consensus process just discussed in this section. To date, the development of technical reports is very rare, occurring perhaps once per decade.

ASACOS

The Acoustical Society of America Committee on Standards (ASACOS) provides the governance to the standards program. Day-to-day decisions and general policy are developed by the executive committee which includes standards director, the chair and vice chair of ASACOS, and the standards manager. Financial and technical policy are developed, by consensus, by the ASACOS steering committee, which includes the members of the executive committee plus chairs and vice chairs of the S committees and subcommittee. The full ASACOS committee includes the members of the steering committee plus a representative from each technical committee of ASA. This committee reviews the budget, approves the nomination report, provides further technical and policy direction, and provides communications in both directions between the standards program and the respective technical committees.

Summary

In summary, the standards program in ASA has an 82-year history. It was instituted along with the *Journal* and technical meetings soon after the ASA was founded in 1929. With the recent additions of S3/SC 1 and TC 43/SC 3, the standards program now spans almost a full breadth of ASA. The accredited procedures of ANSI that are used by the S committees provide for rigorous, transparent process for the development of standards. Finally, it should be clear that standards are one of the primary ways that the ASA promotes the practical application of acoustics. AT

Paul Schomer and his grandson.

Paul D. Schomer, Standards Director for the ASA, has over 40 years of experience, publications, and patents in the areas of environmental noise and its assessment, human and community response to noise, instrumentation and methodology for the measurement and monitoring of noise, sound propagation, and acoustical measurements of building parameters.