



AMERICAN NATIONAL STANDARD

**Acoustical Performance Criteria, Design
Requirements, and Guidelines for Schools,
Part 4: Acoustic Standards for Physical
Education Teaching Environments**

Secretariat:

Acoustical Society of America

Approved on July 29, 2019:

American National Standards Institute, Inc.

Abstract

This document is applicable to gymnasiums and other physical education learning spaces in permanent schools. This standard includes acoustical performance criteria and design requirements for gymnasiums and other physical education learning spaces. Annex A provides procedures for optional testing to determine conformance with the source background noise requirements and the reverberation time requirements of this standard. Annex B provides commentary information on various paragraphs of this standard. Annex C provides guidelines for controlling reverberation in gymnasiums and other physical education spaces. Annex D provides guidelines for controlling background noise in gymnasiums and other physical education spaces.

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**Acoustical Performance Criteria, Design Requirements,
and Guidelines for Schools,
Part 4: Acoustic Standards for Physical Education
Teaching Environments**

ANSI/ASA S12.60-2019/Part 4

Accredited Standards Committee S12, Noise

Standards Secretariat
Acoustical Society of America
1305 Walt Whitman Road, Suite 300
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Foreword

[This Foreword is for information only and is not a part of the American National Standard ANSI/ASA S12.60-2019/Part 4 American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 4: Acoustic Standards for Physical Education Teaching Environments. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the standard.]

This standard comprises a part of a group of definitions, standards, and specifications for use in noise. It was developed and approved by Accredited Standards Committee S12, Noise, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S12 is as follows:

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.

This standard is not comparable to any ISO Standard. It was developed as a counterpart to the ANSI/ASA S12.60 series and should be appended as ANSI/ASA S12.60 Part 4. This standard addresses physical education settings and issues not covered under ANSI/ASA S12.60 Parts 1 through 3.

At the time this Standard was submitted to Accredited Standards Committee S12, Noise, for approval, the membership was as follows:

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Suggestions for improvements to this standard will be welcomed. They should be sent to Accredited Standards Committee S12, Noise, in care of the Standards Secretariat of the Acoustical Society of America, 1305 Walt Whitman Road, Suite 300, Melville, New York 11747. Telephone: 631-390-0215; Fax: (631) 923-2875; E-mail: asastds@acousticalsociety.org.

Introduction

Physical education has the potential to significantly impact the cognitive, affective, and psychomotor development of today's youth in unique ways. It contributes to the overall goals of educating the whole student. Effective physical education programs target not only the development of physical skills but also skills that carry over into every aspect of students' lives. Examples include goal setting, building self-esteem, increased alertness after physical activity, cooperation, tolerance for people with differences, and socialization. Additionally, physical education is unique in that it is the only subject area in the school devoted to human movement, the acquisition of physical skill, and the promotion of fitness. It promotes the development of the whole individual. Physical education instruction also makes students aware of the obesity epidemic and the role they can play in developing a healthy lifestyle. Recent data from the National Center for Health Statistics [1] show that more than 66 million Americans are obese—that's 32 percent of U.S. adults age 20 or older. And the news is equally troubling for younger people. Obesity in children and teens has tripled since 1980, and more than 12.5 million young people between the ages of 2 and 19 are considered overweight. Furthermore, future projections state that by 2030 nearly 50 percent of the U.S. population will be considered overweight or obese.

To meet the challenges of delivering effective physical education programs, it is essential that both architectural and mechanical design provide good acoustical characteristics for gymnasiums and outdoor physical education learning spaces in which speech communication is an important part of the learning process. Excessive background noise or reverberation in such spaces interferes with speech communication and thus presents an acoustical impediment to learning [2, 3]. Moreover, teachers who are providing instruction several hours per day in these environments are at risk for hearing loss due to exposure to excessive noise levels and voice problems as they have to speak over the noise to be heard [4]. In a physical education teaching setting with good acoustical characteristics, learning is easier, deeper, more sustained, and less fatiguing. Teaching should be more effective and less stressful in gymnasiums and outdoor physical education learning spaces with well-designed acoustical characteristics. There can be more effective verbal interaction and less repetition between teacher and students when spoken words are clearly heard and understood [4]. All those in a physical education setting, including teachers and adult learners, will benefit from an environment having the acoustical characteristics recommended in this standard. Special beneficiaries are young children and persons with hearing, language, speech, attention deficit, or learning disabilities; auditory processing disorders; and those learning English who are speakers of other languages. In addition, there is a clear importance of understanding speech in the instance of a crisis or an emergency. If students and teachers cannot clearly understand instructions or directions in response to an emergency, it could result in a non-response or a confused response.

Conformance to the requirements and guidelines of this standard will improve the quality of education by eliminating acoustical impediments for all students and teachers, including those with communication disabilities. This standard seeks to provide flexibility for the design of physical education learning spaces without compromising the goal of obtaining adequate speech intelligibility for all students and teachers in gymnasiums and outdoor physical education learning spaces within the scope of this standard.

American National Standard

Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 4: Acoustic Standards for Physical Education Teaching Environments

1 Scope

1.1 Part 4 of ANSI/ASA S12.60 is applicable to physical education teaching environments including gymnasias, natatoria, and outdoor covered and outside learning spaces of any volume. Annex A provides testing procedures when optional tests are performed to determine conformance with the source background noise requirements and reverberation time requirements of this standard. Annex B provides commentary information on various paragraphs of this standard. Annex C provides guidelines for controlling reverberation in gymnasias and other physical education learning spaces. Annex D provides guidelines for controlling background noise in gymnasias and other physical education spaces.

1.2 Acoustical performance criteria are specified in this standard by limits on the greatest one-hour average A-weighted and C-weighted background noise levels and by limits on the reverberation time when students are expected to be present.

1.3 The control of background noise levels in this standard is achieved primarily by limiting the noise generated by heating, ventilating, and air-conditioning (HVAC) systems.

1.4 This standard applies to siting and building-design-dependent sources of intrusive noise in physical education learning spaces in schools, including noise produced by HVAC systems; building services and utilities; and exterior sound sources such as vehicular traffic, aircraft overflights, or other noise sources. This standard applies to the design and performance of unoccupied spaces and does not apply to sound generated within a physical education learning space by its occupants including voices and the sounds of sport equipment such as volleyball and basketball.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/ASA S1.1 American National Standard Acoustical Terminology

ANSI/ASA S1.13, American National Standard Measurement of Sound Pressure Levels in Air

ANSI/ASA S12.9-2013/Part 3 American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present

ANSI/ASA S12.72-2015, American National Standard Procedure for Measuring the Ambient Noise Level in a Room

ANSI/ASA S12.60-2010/Part 1, American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools

ANSI/ASA S1.4/Part 1/IEC 61672-1, American National Standard Electroacoustics — Sound level meters — Part 1: Specifications (a nationally adopted international standard)