used if approved by the Manager, Atlanta ACO. Operators shall submit their requests through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, Atlanta ACO.

(h)(2) Alternative methods of compliance, approved previously in accordance with AD 96–12–24, amendment 39–9667, or AD 99–13–08, amendment 39–11202, are approved as alternative methods of compliance with paragraph (d) of this AD.

Note 5: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Atlanta ACO.

Special Flight Permits

(i) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

Issued in Renton, Washington, on November 2, 1999.

D.L. Riggin,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 99–29180 Filed 11–5–99; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF JUSTICE

28 CFR Part 16

[AAG/A Order No. 178–99]

Privacy Act of 1974; Implementation

AGENCY: Department of Justice.

ACTION: Proposed Rule.

SUMMARY: The Department of Justice proposes to further exempt the United States Marshals Service Internal Affairs System, JUSTICE/USM–002, from subsections (e)(1) and (e)(5) of the Privacy Act pursuant to 5 U.S.C. 552a(j)(2), (k)(2) and (k)(5). This system is currently exempt from subsections (c)(3) and (4), (d), (e)(2) and (3), (e)(4)(G) and (H), (e)(8), (f) and (g) pursuant to subsections (j)(2) and (k)(5). In addition to records compiled during the course of investigations of allegations of misconduct or criminal violations by USMS personnel, this system also contains records compiled for law enforcement investigations related to actual or potential civil and regulatory violations. The additional exemptions are necessary to avoid interference with such law enforcement investigations and to protect the privacy of third party individuals. The reasons for the exemptions are set forth in the text below.

DATES: Submit any comments by December 8, 1999.

ADDRESSES: Address written comments to the Department of Justice, ATTN: Mary E. Cahill, Management and Planning Staff, Justice Management Division, Washington, DC 20530 (Room 1400, NPB).

FOR FURTHER INFORMATION CONTACT: Mary E. Cahill at (202) 307–1823.

SUPPLEMENTARY INFORMATION: The United States Marshals Service Internal Affairs System, JUSTICE/USM–002, is being published in full text in the Notice section of today's **Federal Register**.

This order relates to individuals rather than small business entities. Nevertheless, pursuant to the requirements of the Regulatory Flexibility Act, 5 U.S.C. 601–612, it is hereby stated that the order will not have a ''significant impact on a substantial number of small entities.''

List of Subjects in 28 CFR Part 16

Administrative practice and procedure, Courts, Freedom of Information Act, Government in the Sunshine Act, and the Privacy Act.

Dated: October 22, 1999.

Janis A. Sposato,

Acting Assistant Attorney General for Administration.

Pursuant to the authority vested in the Attorney General by 5 U.S.C. 552a and delegated to me by Attorney General Order No. 793–78, it is proposed to amend 28 CFR part 16 as follows:

PART 16—[AMENDED]

1. The authority for part 16 continues to read as follows:

Authority: 5 U.S.C. 301, 552, 552a, 552b(g), 553; 18 U.S.C. 4203(a)(1); 28 U.S.C. 509, 510, 534; 31 U.S.C. 3717, 9701.

2. It is proposed to amend 28 CFR 16.101 by revising paragraphs (e) introductory text, (e)(1), (f)(1), and (f)(3); by redesignating paragraphs (f)(7), (f)(8) and (f)(9) as paragraph (f)(8), (f)(9) and (f)(10) and adding new paragraph (f)(7) to read as follows:

§ 16.101 Exemption of U.S. Marshals Service Systems—limited access, as indicated

* * * * *

(e) The following system of records is exempt from 5 U.S.C. 552a (c) (3) and (4), (d), (e) (1), (2) and (3), (e) (4) (G) and (H), (e)(5), (e)(8), (f) and (g).

(1) Internal Affairs System (JUSTICE/USM–002)—Limited access.

These exemptions apply only to the extent that information in this system is subject to exemption pursuant to 5 U.S.C. 552a (j)(2), (k)(2) or (k)(5). Where compliance would not interfere with or adversely affect the law enforcement process, the USMS may waive the exemptions, either partially or totally.

(f) * * *

(1) From subsections (c)(3) and (d) to the extent that release of the disclosure accounting may impede or interfere with civil or criminal law enforcement efforts, reveal a source who furnished information to the Government in confidence, and/or result in an unwarranted invasion of the personal privacy of collateral record subjects or other third party individuals.

* * * * *

(3) From subsection (e)(1) to the extent that it is necessary to retain all information in order not to impede, compromise, or interfere with civil or criminal law enforcement efforts, e.g., where the significance of the information may not be readily determined and/or where such information may provide leads or assistance to Federal and other law agencies in discharging their law enforcement responsibilities.

* * * * *

(7) From subsection (e)(5) because in the collection of information for law enforcement purposes it is impossible to determine in advance what information is accurate, relevant, timely and complete. With the passage of time, seemingly irrelevant or untimely information may acquire new significance and the accuracy of such information can only be determined in a court of law. The restrictions imposed by subsection (e)(5) would restrict the ability to collect information for law enforcement purposes and interfere with the preparation of a complete investigative report or otherwise impede effective law enforcement.

* * * * *

[FR Doc. 99–28630 Filed 11–5–99; 8:45 am]

BILLING CODE 4410–AR–M

ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD

36 CFR Chapter XI

[Docket No. 98–4]

Response to Petition for Rulemaking on Classroom Acoustics

AGENCY: Architectural and Transportation Barriers Compliance Board.

ACTION: Response to petition for rulemaking on classroom acoustics.

SUMMARY: This document responds to a petition for rulemaking on classroom

acoustics. The Architectural and Transportation Barriers Compliance Board (the Access Board) will support the development of a standard on classroom acoustical design by the American National Standards Institute (ANSI) Committee on Noise (S–12), under the secretariat of the Acoustical Society of America (ASA). Resources and technical assistance on classroom acoustics are provided in this document.

FOR FURTHER INFORMATION CONTACT: Lois Thibault, Office of Technical and Information Services, Architectural and Transportation Barriers Compliance Board, 1331 F Street NW., suite 1000, Washington, DC 20004–1111. Telephone number (202) 272–5434 extension 132 (voice); (202) 272–5449 (TTY). These are not toll-free numbers. Electronic mail address: thibault@access-board.gov.

SUPPLEMENTARY INFORMATION:

Availability of Copies and Electronic Access

Single copies of this publication may be obtained at no cost by calling the Access Board's automated publications order line (202) 272–5434, by pressing 2 on the telephone keypad, then 1, and requesting publication C–12. Persons using a TTY should call (202) 272–5449. Please record a name, address, telephone number and request publication C–12. This document is available in alternate formats upon request. Persons who want a copy in an alternate format should specify the type of format (cassette tape, Braille, large print, or computer disk). This document is also posted on the Board's Internet site at http://www.access-board.gov/rules/acoustic2.htm.

Background

The Architectural and Transportation Barriers Compliance Board [1] (Access Board) is responsible for developing accessibility guidelines under the Americans with Disabilities Act of 1990 (ADA) to ensure that new construction and alterations of facilities covered by the law are readily accessible to and usable by individuals with disabilities. The Access Board initially issued the Americans with Disabilities Act Accessibility Guidelines (ADAAG) in 1991. The guidelines contain scoping provisions and technical specifications for designing elements and spaces that typically comprise a building and its site so that individuals with disabilities will have ready access to and use of a facility. Although ADAAG contains a number of provisions for access to communications, including requirements for text telephones, assistive listening systems, and visible alarms, it does not include provisions for the acoustical design or performance of spaces within buildings and facilities.

On April 6, 1997, the Access Board received a petition for rulemaking from a parent of a child with a hearing loss, requesting that ADAAG be amended to include new provisions for acoustical accessibility in schools for children who are hard of hearing. Several acoustics professionals, parents of children with hearing impairments, individuals who are hard of hearing, and a coalition of organizations representing them had also urged the Board to consider research and rulemaking on the acoustical performance of buildings and facilities, in particular school classrooms and related student facilities.

On June 1, 1998, the Board published a Request for Information (RFI) in the **Federal Register** to gather public input on this issue (63 FR 29679). The Board sought comment on a variety of issues in the notice and indicated that it would determine a course of action after evaluating responses to the notice. Alternatives included research, rulemaking, and technical assistance on acoustical issues. Approximately 100 comments were received in response to the RFI. The preponderance of the comments were from parents of children with hearing impairments and from professionals in acoustics and audiology. Few comments were received from school systems.

A Board review of classroom acoustics also identified several key issues. A third of the school systems cited in a 1995 General Accounting Office study reported that acoustics for noise control was their most serious environmental concern. Studies of elementary and secondary school classrooms revealed that excessive background noise, which competes with the speech of teachers, aides, classmates, and audio educational media, is common even in new classrooms. School construction is again on the increase and much public and governmental attention is now being focused on education issues.

Comments

Commenters submitted research which showed how high levels of background noise in classrooms compromise speech intelligibility for children with hearing loss and other auditory disabilities and limit the effectiveness of assistive technologies (such as hearing aids, FM systems, and soundfield amplification) for such students, so that their reading, communication, and learning skills may not develop adequately.

Audiologists noted that children, because they are neurologically immature and lack the experience necessary to predict from context, are inefficient listeners who require optimal conditions in order to hear and understand. Those who miss key words, phrases, and concepts because of poor listening conditions must struggle to keep up and may later do poorly academically and suffer from behavior problems. At particular risk are children who are experiencing temporary hearing loss from otitis media (as much as 15% of the school age population, according to a recent Centers for Disease Control analysis), children with mild to moderate permanent hearing losses, children with speech impairments, children who have learning disabilities and central auditory processing disorders, children for whom English is a second language, and very young children generally.

Acoustical consultants confirmed that controlling the reverberation within a classroom and limiting the background noise generated both outside and within a space could provide significant improvement in speech transmission indices (STI) and signal-to-noise ratios (SNR) necessary for optimal performance of assistive technologies. Heating, ventilating, and air conditioning (HVAC) units and systems were identified as primary contributors to classroom noise. It was also noted that self-noise in classrooms can be dramatically reduced with reductions in reverberation time and background noise.

Commenters familiar with school design and construction, including State education agencies, architects, and engineers, agreed that background noise and reverberation could be controlled using standard means and materials of construction. It was noted that new computer software makes it possible to quickly analyze listening conditions under a variety of design, construction, and finishing and equipment choices (basic acoustical design for classrooms

[1] The Access Board is an independent Federal agency established by section 502 of the Rehabilitation Act (29 U.S.C. 792) whose primary mission is to promote accessibility for individuals with disabilities. The Access Board consists of 25 members. Thirteen are appointed by the President from among the public, a majority of who are required to be individuals with disabilities. The other twelve are heads of the following Federal agencies or their designees whose positions are Executive Level IV or above: The departments of Health and Human Services, Education, Transportation, Housing and Urban Development, Labor, Interior, Defense, Justice, Veterans Affairs, and Commerce; the General Services Administration; and the United States Postal Service.

can also be accomplished with pencil-and-paper calculations). Many textbooks, manuals, and guides are available on architectural acoustics, and include values for the noise resistance of wall construction and the sound absorbency of common surfacing materials. Recommendations for limits on reverberation and background noise in classrooms have been included in architectural and engineering texts on acoustics for more than 40 years.

Commenters pointed out that acoustical standards already exist in the model building codes, particularly for housing; in several State education and health department requirements for schools, in requirements for Federal courtroom design and construction, and in the building codes covering school construction in a number of European countries. HVAC equipment is commonly rated for noise output under a number of ANSI protocols, and the Los Angeles Unified School District has recently begun to require manufacturers and installers to observe noise thresholds on HVAC equipment placed in its schools. Two Fellows of the Acoustical Society of America (ASA) noted that the Society had formed a Working Group on Classroom Acoustics in 1997 under the ANSI Committee on Noise (S–12) and recommended that the Board pursue the joint development of a standard for classroom acoustics with the Working Group, which was preparing a draft standard for consideration.

Action

Following a detailed analysis of the comments and research submitted in response to the RFI, the Access Board agrees that many classrooms are likely to include children for whom background noise must be controlled in order to optimize listening conditions. Furthermore, the Board has determined that collaboration with the existing ANSI/ASA Working Group on Classroom Acoustics would be the most effective way to develop technical and scoping recommendations for classroom acoustics. On March 10, 1999 the Board voted to support the efforts of the Working Group to draft a common standard for classroom acoustics that will incorporate criteria for children with disabilities. The ASA agreed to broaden the membership of the Working Group to involve other groups, including representatives of school systems, school designers, disability organizations, the U.S. Department of Education, and the Access Board and committed to a 2-year standards development process. The Access Board will fund some administrative costs of the Working Group and will consider additional funding, if necessary. After the standard has been ratified by the Committee on Noise, the Board will pursue its enforceability under the ADA or other statutes. This course of action is consistent with the Board's goal to take a leadership role in the development of codes and standards for accessibility and with the National Technology Transfer and Advancement Act of 1995, which requires Federal agencies to consider the use of private sector standards where appropriate.

In May 1999, the Working Group was expanded with the addition of representatives of the Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell), Self Help for Hard of Hearing People (SHHH), the American Speech-Language-Hearing Association (ASHA), the American Federation of Teachers (AFT), The American Institute of Architects (AIA), the Council of Educational Facility Planners (CEFPI), the Educational Audiology Association (EAA), the American Academy of Audiology (AAA), the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), and the American Society of Testing and Materials (ASTM). Other members may be added at the discretion of the Working Group co-chairs, the Access Board, and the U.S. Department of Education.

Both the Access Board and the U.S. Department of Education will be active participants in the Working Group. In addition to the Acoustical Society of America (ASA), Working Group members from the acoustical professions represent the Institute of Noise Control Engineering (INCE) and the National Council of Acoustical Consultants (NCAC).

The first meeting of the newly-expanded Working Group was held on May 18, 1999 in Fairfax, VA to consider a draft standard. The next meeting of the Working Group will take place on November 5–6, 1999 in Columbus, OH. Other meetings will be scheduled as required. All meetings will be open to the public. For further information, contact: Charles E. Schmid, Executive Director, Acoustical Society of America, 365 Ericksen Avenue, Suite 324, Bainbridge Island, WA 98110, (206) 842–6001, charles@aip.org. It is expected that a draft standard will be recommended to the Committee on Noise in Spring 2001 for balloting.

Until a standard for classroom acoustics can be implemented, the Access Board offers the following technical assistance for the information of design professionals, schools, parents, and others who seek guidance on how to provide an acoustical environment that supports listening and learning.

Technical Assistance

Many factors, including design and construction methods, teaching techniques, and amplification technologies, can affect the listening conditions in a classroom. Primary among them is background noise, of which there are several sources, some more amenable than others to treatment by design and construction means. Self-generated noise, for example, particularly in the lower grades, may be difficult to control. While a quiet room can minimize the need for raising the voice (and carpeting can soften the sound of footfalls and furniture), self-noise can be only partially ameliorated by architectural means. Reverberation—sounds that reflect from hard surfaces and arrive back at the listener's ear at different times—adds to background noise levels and smears the clarity of direct sound, thus reducing speech intelligibility. Fortunately, reverberation is relatively easy and economical to control—even in existing classrooms—by adding absorbent materials to certain room surfaces.

Speech Intelligibility

Background noise both competes with and obscures the useful speech and other signals in a classroom. The greater the noise and reverberation in a room, the louder the signal must be to be heard and understood. Speech intelligibility is in part a function of the signal-to-noise ratio (SNR). The SNR at a child's ear is the difference between the loudness of the signal (the teacher's voice, for example, typically about 60 dB) and the loudness of the competing noise in the room, from heating, ventilating, or air conditioning systems or other noise from within or outside the classroom (often measured in the 45–55 dB range in classrooms). And because loudness varies with distance (every doubling of the distance between speaker and listener causes a 6 dB drop in signal loudness), the SNR will vary as a child or teacher moves about the classroom.

Decibel levels are usually measured at 3 feet from the speaker. When there are 6 feet—twice the distance—between speaker and listener, only 54 dB of the 60 dB delivered by the typical teacher reaches the student. At 12 feet, only 48 dB arrive. At 24 feet—the back row of a small classroom—only 42 dB will be audible. In some locations and at some times, the loudness of the background noise in a classroom may well exceed the loudness of the desired sound signal. Research has shown that children who have temporary and permanent hearing loss need an SNR of at least +15—that is, 15 dB greater than the background noise—for adequate speech intelligibility.

Children with other disabilities will also benefit from good classroom acoustics. In particular, children who receive speech therapy—the most frequently delivered special service in elementary schools '' need good listening conditions for themselves and their listeners. Research suggests that children who have auditory processing, language, and learning disabilities, particularly attention deficit disorders, find it easier to focus on an educational task if the SNR is higher. Audiologists have also called attention to children at risk because of age (young children just acquiring language generally need higher SNR values than adults) and native language (children for whom English is a second language have similar needs). Every student will learn more effectively in good listening conditions, but for children with hearing loss, including the often-undiagnosed temporary losses due to the common, chronic ear infections of childhood, good acoustics are an essential basis for learning and for other remediations necessary to learning.

Amplification

Many children with hearing loss will use both personal (hearing aid) and classroom (radio frequency or FM) amplification to maximize SNR values. Amplification technologies can supplement the speech signal but cannot compensate for (or overcome) a poor acoustical environment. To be effective, amplification requires control of reverberation times and background noise. Furthermore, background noise, when amplified, can be painful and disruptive for children with a variety of auditory disabilities.

Many schools are now installing soundfield systems—amplification distributed throughout the classroom—to improve listening conditions for all students, not just those who have hearing impairments. Note, however, that such amplification will add to background noise in work areas within the room and may impinge on adjacent spaces without adequate acoustical barriers in partition walls. In addition, most assistive listening and soundfield systems require that the speaker use a microphone, which may not always be feasible in group situations. Input from other speakers—aides, peers, and audio equipment, for instance—will not generally be amplified, and casual remarks may be missed. Educators recognize that the incidental learning that occurs in a classroom is as important to socialization, skill mastery, and self-esteem as is the formal curriculum delivered by the teacher. And instructional methods are changing to small-group, computer-supported learning that makes it difficult to utilize these amplification technologies. By optimizing basic room acoustics, design professionals can ensure that all children have maximal access to teaching 'signals', both directly and through assistive technologies.

Design Issues

The characteristics of good architectural acoustics and the means to achieve good listening conditions in classrooms are well-known and not difficult or costly to apply in new construction and alterations. School architects who have had a standard education in HVAC and acoustical design may not even require the services of the acoustical consultant they would expect to include in a contract for the design of an audiovisual facility, auditorium, or concert hall. Facility and room acoustical design for good listening and learning environments will consider:

• Site, space, and classroom adjacencies that minimize classroom exposure to environmental, equipment, and occupancy noise;

• Room size and proportion for appropriate sound reflection and absorption;

• Slab, ceiling, roof, and wall construction (including doors and windows) that are appropriate barriers to noise;

• HVAC equipment selection, system design, and installation that minimizes structure, duct, and operating noise;

• Finishes selected and located for proper reverberation control, and

• Attention to electronic and radio-frequency interference with assistive devices.

Good detailing, tight specifications, and careful construction and finishing will also be necessary to ensure that the facility and the spaces within it meet design intent. In general, the objectives of classroom acoustical design should be to control and limit background noise and reverberation.

Background Noise

Noise can be mitigated at the source, along its path, and at the receiver. A combination of small improvements at each point can often produce the most cost-effective noise reduction. In general, favorable architectural acoustics will depend upon construction that resists the passage of sound, finishes that absorb sound energy, and HVAC design that minimizes noise output.

The now-common practice of heating, cooling, and ventilating classrooms using through-the-wall or roof-mounted units has had a significant and deleterious effect on classroom acoustics. Few manufacturers have yet been motivated to control the noise of fans, compressors, and air movement through grilles that contributes the largest proportion of background noise in most existing classrooms. The research literature is replete with teacher reports of the need to turn off the heating or cooling unit during important lessons. Children with hearing loss must always be seated away from such noise sources and close to the teacher. While retrofit enclosures can achieve a reduction in noise output, it has been found to be a costly fix that few schools will fund. Ducted (and piped) systems with central HVAC equipment are much more suited to noise management through isolation and the manipulation of duct sizing, length, openings, and lining, but are often a casualty of cost-cutting. Unit ventilators are typically specified for hotel and motel guestroom construction where the background noise they contribute helps maintain acoustic privacy between rooms; as currently engineered, they are not appropriate for spaces in which communication is a primary function. What is most needed is a collaboration between schools, designers, and manufacturers to reduce the noise levels of such units, a re-engineering process that is being applied to many appliances and equipment.

Background noise from the exterior environment can be managed with wall construction of appropriate sound resistance and the specification of multi-pane glazing and well-insulated and isolated frames typically required for energy conservation (sound reduction can be enhanced by pairing glass of different thicknesses). Windows and other openings are the weak link in building enclosure. Where exterior noise is significant, it will not be possible to maintain speech intelligibility in classrooms with the windows open.

Background noise can also enter the classroom from adjacent spaces—other classrooms, the gymnasium, cafeteria, or auditorium, and corridors—through walls, doors, plumbing chases, and ducts. Sound-resistant slab, wall, and ceiling construction and well-gasketed, sound-rated doors are the answer here. When designing building alarm systems, it is a good idea to pair visible (strobe) and audible alarms in classrooms, since room enclosures with high Sound Transmission Class (STC) values may mute corridor bells.

Noise generated within the classroom also contributes to background noise levels. Audio-visual equipment, computers, the pump in an aquarium, even lighting ballasts add decibels to the mix. The self-noise of students working in small groups can be mitigated by increasing absorbent surfaces. Carpeting is used in many elementary schools to quiet the noise of footfalls and furniture shifting by younger children, who need higher SNRs for speech intelligibility. Recent advances in carpet technology have led to the availability of bacteria-resistant floor coverings.

Reverberation

Reverberation is the measure of the time (in seconds) that it takes a given sound to decay by 60 decibels. Long reverberation times are not desirable because late-arriving sounds blur speech clarity and increase background noise. However, early sound reflections in rooms can actually reinforce the speech signal and improve SNR if they arrive at the listener's ear within 50 milliseconds. By placing materials to reflect early sound and absorb late-arriving noise, it is possible to optimize the reverberant characteristics of a given room.

A recent paper by Rebecca Reich and John Bradley of the Canadian National Research Council reports on their investigation of classroom reverberation through computer modeling. Using the ODEON room acoustics ray tracing program (version 2.6 for DOS), researchers were able to identify optimum conditions for speech as a reverberation time of 0.5 seconds (the research also showed that speech intelligibility varied only one-half of one percent between reverberations of 0.3 and 0.6 seconds). Nine different placements of material, each with the same total of sound absorption, were tested. When the source position was located at the head of the room, in traditional classroom style, speech clarity was found to be optimal when the absorptive material was located on the upper portions of classroom side and rear walls.

Interference

Interference from lighting ballasts, radio frequency sources, HVAC controls, and other electrical, electronic, microwave and even infrared sources can compromise the effectiveness of assistive technologies and has become an increasing problem for many people who are hard of hearing. Young children with hearing loss may not be able to identify and call attention to malfunctioning devices. In extreme cases, such as schools located in the path of transmission towers or equipment, it may be necessary to install shielding in exterior wall and roof assemblies.

Accessibility Recommendations

In 1995, the American Speech-Language-Hearing Association (ASHA) published a Position Statement on Acoustics in Educational Settings that called for ''appropriate acoustical environments in all educational settings, to include classrooms, assembly areas, and communications-related treatment rooms''. ASHA's Acoustical Guidelines recommend that:

- Unoccupied classroom noise levels should not exceed 30 dB(A) or a Noise Criteria (NC)-20 curve [2]
- Reverberation times should not exceed 0.4 seconds, and
- The SNR at a student's ear should exceed a minimum of +15.

The ASHA recommendations are backed by substantial research and are the most authoritative on the subject of listening conditions for children who have hearing loss and other disabilities. An extensive bibliography is included. Self Help for Hard of Hearing People (SHHH), an advocacy organization, has endorsed the ASHA guidelines. AG Bell, an organization whose membership is over 50 percent parents of children with hearing loss and includes many professionals who work with children, advises its members to utilize the ASHA guidelines in advocating for an appropriate acoustical environment for children with hearing loss.

Industry Recommendations and Standards

Industry coverage of acoustical issues rarely includes discussion of the characteristics of good listening conditions for people who are hard of hearing, although specialists in the design of facilities for people who are elderly have begun to recognize this as a significant issue. Acoustical design for children's environments is not typically distinguished from practices suitable for adults.

Criteria for classroom listening conditions at three levels of quality were recently outlined in ''Goals and Criteria for Acoustical Planning'', a presentation by R. Kring Herbert, FASA, at the 1999 conference ''Eliminating Acoustical Barriers to Learning in Classrooms'' in New York City, organized by the coalition formed to submit comment to the Board's RFI:

Listening conditions	A-weighted sound level (dBA)	Room criteria (RC), Neutral [1]	RT–60 (seconds)
Desirable (new construction)	31	RC–25N	0.5
Adequate (alterations)	36	RC–30N	0.5
Poor	41	RC–35N	0.5

[1] Room criteria ratings were developed to assess the effect on listeners of HVAC noise, which can be annoyingly ''hissy'' (H) in the high frequencies and ''rumbly'' (R) in the low frequencies. Sound pressure levels for RC curves are lower at both extremes (46 dB maximum at 63 Hz and 13 dB maximum at 8000 Hz for RC–20) than NC curves, although they are identical at mid-range (26 dB at 500 Hz).

Textbooks on acoustical design typically contain guidelines for maximum background noise in different occupancies. Recommendations in current publications show a range of 25 dB(A) to 35 dB(A) maximum for the interior sound level in unoccupied classrooms. Most texts do not distinguish between classrooms for children and classrooms for adults. Only Egan, of those consulted in the Board's analysis, considered hard-of-hearing users. Egan recommends a 5 dB reduction in background noise for facilities serving people who have hearing loss. Reverberation times between 0.5 and 0.8 seconds have been recommended for classroom uses.

[2] NC curves weight sound pressure levels across 8 standard frequencies to approximate human perception of sound, which is greater in the high frequencies. To meet NC–20, sound pressure level at the lowest standard frequency (63 Hz) can be as much as 50 dB, while at the highest frequency (8000 Hz) it can be no more than 16 dB).

The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) in its 1995 Handbook suggests a Room Criteria maximum of RC–40N for small classrooms (<750 SF) and RC–35N for larger classrooms. This is considerably higher than most acoustical textbooks recommend, and recognizes no adjustment for classrooms for children or for people who have hearing loss.

The American National Standards Institute (ANSI) in S12.2–1995, ''Criteria for Evaluating Room Noise'' suggests RC–25–30 for lecture halls and classrooms and RC–35–40 for open plan facilities (where it is significantly more difficult to control background noise). Again, no adjustment is suggested for younger listeners or those who have hearing impairments.

Acoustical Modeling and Measurement

Computer modeling is a useful way to project the effects of various design decisions and materials selections on the speech intelligibility of a classroom. Professional engineering software for acoustics analysis has been used for many years in the design of performance halls. New user-friendly software packages are now becoming available to assist non-specialists to determine reverberation time and specify proper locations and areas of absorbency.

Both background noise and reverberation time can also be calculated from relatively simple equations contained (and explained) in most acoustics texts. Editions of M. David Egan's text ''Concepts in Architectural Acoustics'' has been a standard reference work for students of architecture since 1972. Tables of material and assembly characteristics needed for acoustics computations, including values for absorbency, sound transmission, impact isolation and other factors, are published in many textbooks; 'Part IX Acoustics', in ''Mechanical and Electrical Equipment for Buildings'', by Stein, Reynolds, and McGuinness, has been an assigned text for architecture and engineering students through eight editions. Many manufacturers of acoustical finishes and products also provide details on wall, partition, slab, ceiling, and roof design in catalogs and product data sheets. ''Architectural Graphic Standards'' and ''Timesavers Standards'', key resources for design professionals, both contain basic information on architectural acoustics and noise control, including design and construction details and noise reduction values.

Background noise in existing facilities can be metered on several scales, including the A scale, which is adjusted for human hearing. Simple inexpensive devices may be adequate to determine the existence of an acoustical problem, but more sophisticated and costly devices are necessary to perform an acoustical analysis. Reverberation meters also exist, although they do not seem to be much used by consultants.

Standard-Setting and Regulation of the Acoustical Environment

Acoustical standards are of two general types: performance standards, usually combined with a testing protocol, as with ANSI and ASTM standards, or design and construction standards that require a specified sound absorbency or sound transmission or resistance value in building elements—ceilings, walls, windows—known through prior testing to achieve certain results.

Because design, construction, and use all affect the acoustics of a space, design professionals are understandably wary of single-number requirements for reverberation and background noise. A 5 dB difference in room performance could be due to meter quality, changes or omissions in construction, lack of equipment maintenance, teacher fatigue, or even a new flight pattern at a nearby airport.

Sweden, Portugal, Germany, and Italy all have acoustical standards for educational facilities. The Swedish standard is based upon room area and absorbency values for ceiling tiles (the higher the absorbency rating of the material, the less area is required) and on the sound transmission class of wall, floor, and roof/ceiling assemblies. Italy's standard prohibits school construction where environmental noise exceeds certain levels (as, for example, near airports, rail lines, and highways). Research is underway in Great Britain to establish classroom standards for children who are hard-of-hearing.

In the United States, the New York State Department of Education published a manual for classroom design and construction that sets 35 dB(A) as a background noise 'objective' for State school construction. Washington State Department of Health regulations also limit background sound to 35 dB(A) in classrooms. The Los Angeles Unified School District has attempted to limit noise from through-the-wall and rooftop HVAC units through their purchasing program, specifying a 35 dB maximum for equipment noise. The Access Board understands that the School District has not been able to identify a manufacturer of complying units. The District hopes that purchasing volume may encourage manufacturers to develop quieter models.

The model codes (BOCA, UBC, SBC), several state departments of education or health, and the Department of Housing and Urban Development have already adopted acoustical standards for multifamily residential occupancies that establish minimum values for Sound Transmission Class (STC) and Impact Isolation Class (IIC) of wall and slab/roof assemblies. Multifamily housing in California is subject to design and construction standards for acoustical performance. Environmental (exterior) noise is also limited by regulation in many jurisdictions, and others require construction that will provide an interior noise level of no more than 45–55 dB.

Resources

There are many other resources available for parents, schools, audiologists, advocates, and design professionals who wish to improve their understanding of issues in classroom acoustics. A coalition of organizations assembled in 1998 to respond to the Access Board's Request for Information (RFI) maintains a lively listserv and archive at classroomacoustics@onelist.com and contains links to other sites of interest. Professional members include the Acoustical Society of America, Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell), the American Academy of Audiology (AAA), the American Speech-Language-Hearing Association (ASHA), the Educational Audiology Association (EAA), the National Council of Acoustical Consultants (NCAC), Self Help for Hard of Hearing People (SHHH), and the Council of Educational Facility Planners, International (CEFPI). The U.S. Department of Education maintains a National Clearinghouse on Education Facilities. Its website on classroom facility design at http://edfacilities.org includes references to research and publications on classroom acoustics.

Additional reading and reference material, including electronic links to other websites of interest, will be posted on the Access Board's website at http://www.access-board.gov/rules/acoustic3.htm.

June I. Kailes,

Chair, Architectural and Transportation Barriers Compliance Board.

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