



# UPDATE



The Newsletter of the Council for Accreditation in Occupational Hearing Conservation

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## Chair's Message

by Susan Cooper Megerson, MA CCC-A

CAOHC Chair, Representative of the American Speech-Language-Hearing Association



For many first-time course attendees, the flurry of abbreviations presented by your Course Director on day one of the C A O H C

course can be overwhelming (dB, HCP, SPL, NRR, not to mention CAOHC, etc.). In particular, there are a number of regulatory and standards agencies that are influential in how we administer Hearing Conservation Programs in our workplaces. This issue of UPDATE focuses on a number of timely regulatory and standards issues of interest to hearing conservation professionals. Before you delve into this issue, read on for a brief reminder of duties and responsibilities of some of the agencies featured in our news articles this quarter.

The Occupational Safety and Health Administration (OSHA) is

part of the Department of Labor, and is charged with enforcing *most* workplace health and safety standards (you may be aware that the railroad, maritime, and mining industries, to name a few, have separate regulatory agencies). OSHA has responsibility for establishing safe exposure limits and regulations for protective measures, and also for providing consultative support to business and industry. There are currently 10 regional OSHA offices where information and publications may be obtained. There are also approximately 25 states that have separate plans for fulfilling health and safety standards. State regulations and enforcement practices must be at least as stringent as federal OSHA guidelines, and a number of states have adopted practices which are more stringent than federal mandates require. Therefore, be sure to check with your regional or state office regarding which regulations and practices apply in your area.

The National Institute for Occupational Safety and Health (NIOSH) is a division of the Centers for

Disease Control and is responsible for conducting research to make workplaces healthier and safer. NIOSH conducts laboratory and epidemiological research, publishes its findings, and makes recommendations to regulatory agencies such as OSHA. (See Lee Hager's article on page 3 regarding NIOSH's latest recommendations for occupational noise exposure.)

The Environmental Protection Agency (EPA) is a federal agency which administers various federal environmental protection laws. Although EPA currently has formal responsibility for administering programs for noise control, the agency's Office of Noise Abatement and Control was disbanded in the early 1980's for budgetary reasons. (See Elliott Berger's article beginning on this page for an explanation of implications for the use of hearing protection.)

The American National Standards Institute (ANSI) is a private, non-profit membership organization which approves national consensus standards and

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## A New ANSI Standard for Measuring Hearing Protection

E. H. Berger, M.S.

CAOHC Representative of the American Industrial Hygiene Association

A new national standard that describes how to measure, in the laboratory, the real-ear attenuation of hearing protection devices (HPDs), was approved last year by the American National Standards Institute (ANSI). This standard, entitled *Methods for Measuring the Real-Ear Attenuation of Hearing Protectors (S12.6-1997)* was the culmination of nearly a decade of research by Accredited Standards Working Group, S12/WG11, chaired by Elliott H. Berger, Senior Scientist, Auditory Research, E•A•R/Aearo Company. The new standard updates and replaces the 1984 version of

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## UPDATE

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## FAREWELL TO THREE COUNCIL MEMBERS

On behalf of the CAOHC Council, over 19,000 Occupational Hearing Conservationists, 400 Course Directors, and the Executive staff, our thanks and appreciation for 10 years of service on the CAOHC Council to Jeffrey Morrill, MS, former Council Chair; Barbara Panhorst-Lassiter, EdD RN COHN-S, former Council Chair; and Jill Niland, CIH CSP, Screening Committee Chair. We will miss their presence at Council meetings but their influence on the conservation of hearing health in industry will continue. CAOHC wishes all of you success in your future endeavors.

## Acoustical Considerations for Effective Emergency Alarm Systems in an Industrial Setting Part Two

*David C. Byrne, MS CCC-A, and Dennis P. Driscoll, PE  
Associates in Acoustics, Inc., Evergreen, Colorado*

### Implications for Engineering Noise Controls

A majority of noise sources encountered throughout many plants are relatively steady-state, which means that their sound levels do not fluctuate over time. However, periodic steam or compressed air releases may temporarily exceed the ambient level by 10 dB or more. These (and other) types of intermittent noise sources may interfere with effective communication by temporarily masking the alarm signal or notification message.

Designing an emergency warning system for use in steady-state noise levels is much easier than trying to account for sporadic fluctuations in the background sound level, particularly when the intermittent sounds are high intensity and of relatively short duration. Therefore, consideration should be given to eliminating or reducing the noise from these types of sources, as another method to ensure adequate voice communication. Properly selected and installed silencers or mufflers may solve most of these problems; however, it is recommended that a detailed acoustical engineering analysis be conducted to define the appropriate control technique.

Although implementation of engineering noise controls may not be required to maintain compliance with the OSHA Occupational Noise Exposure Standard (29 CFR 1910.95), reduction of noise levels may still be desirable. In addition to treating intermittent noise sources, engineering control treatments should be investigated for certain high intensity steady-state noise sources as well. Lower noise levels will allow for more effective communication, provide a better working environment, and may enable hearing conservation measures to be eliminated in some buildings or areas.

### Special Considerations

It is important to recognize that all contingencies may not be able to be accounted for in all circumstances. In particular, the hearing and auditory processing abilities of an individual employee may vary from day to day, which may cause an alarm signal to go undetected or unrecognized. Therefore, persons with known or suspected hearing deficiencies or problems may have to be accounted for on an individual basis.

### Effects of Hearing Protection and Hearing Loss on Warning Signal Perception

Significant communication problems are often encountered by individuals with various degrees of hearing loss. High-frequency hearing loss is usually the consequence of long-term exposure to excessive noise levels, as well as a typical result of the aging process. As previously mentioned, high-frequency hearing ability is essential to the understanding of spoken language. Therefore, hearing-impaired individuals are at a disadvantage even before the effects of an inadequate communication system or high ambient noise levels are introduced. The problem is exacerbated when an employee with hearing loss must wear hearing protection in the work environment.

Many industrial employees dislike wearing hearing protectors based on their complaints that the protectors interfere with necessary speech communication. However, hearing protectors attenuate both the speech and background noise by equal amounts, and therefore should not adversely affect speech reception ability for normal-hearing listeners. In fact, wearing hearing protection in high

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# Changes Coming: NIOSH Releases Criteria Document

by Lee Hager, Executive Vice President  
James, Anderson & Associates, Inc.

After 2 years and much debate, NIOSH has released the new *Criteria for a Recommended Standard: Occupational Noise Exposure*. The Criteria Document is the NIOSH process for alerting OSHA that research and science in a given area of occupational health and safety supports a new or revised regulation. In NIOSH's words; "Criteria documents provide the scientific basis for new occupational safety and health standards." The first NIOSH Criteria Document on noise, released in 1972, provided much of the technical basis for the Hearing Conservation Amendment as we know it today.

Even though OSHA is not required to take the advice offered by NIOSH in the new document, and indeed is not compelled to address the NIOSH initiative in any fashion, the document merits close scrutiny by hearing conservation professionals. The 1998 Criteria Document may well serve as a default "best practice" standard in future litigation.

The June document released by NIOSH (Publication Number 98-126, available free of charge from NIOSH at 1-800-35NIOSH, or at their website at <http://www.cdc.gov/niosh>, look under Publications), appears to be little changed from the draft Criteria Document circulated in 1996. The document itself is brief and to the point, covering the important issues in about 10 pages. The balance of the 70 plus page publication provides the rationale for the proposed changes, and includes citations for the research considered in the development of the new document.

The new Criteria Document addresses nearly all of the aspects of hearing conservation (or in NIOSH's new terminology, hearing loss prevention) practice.

## Exposure

NIOSH has moved away from the current OSHA position of dual action and criterion levels, going instead with a single Recommended Exposure Limit (REL) of 85 dBA. The rationale behind this move is to offer greater protection to noise-exposed workers, citing research that indicates an 8% excess risk of hearing loss at the 85 dBA TWA limit as opposed to 25% excess risk at 90 dBA TWA.

In addition, NIOSH recommends the 3-dB exchange rate in determining noise exposure instead of OSHA's current 5-dB exchange rate.

The new NIOSH document provides for exposure up to 140 dBA, with allowable exposure times falling to less than 1 second. This could be interpreted as raising the default exposure ceiling limit to 140 dB. By publishing exposure tables that provide no allowable time at any exposure above 115 dBA, OSHA effectively adopted that value as a ceiling limit, or a not-to-be-exceeded exposure.

Instead of the current OSHA position of requiring monitoring once to determine risk, then only as conditions change for the worse, NIOSH recommends exposure monitoring every 2 years.

## Hearing Protection

NIOSH has adopted a "dose" approach for hearing protection, with HPD to be selected on the basis of 8-hour TWA, consistent with current OSHA policy. However, the protection goal for HPDs

has been dropped to 85 dB for all exposed workers from OSHA's current dual criteria of 90 dB for most workers and 85 dB for those with STS.

NIOSH's proposal for assessing hearing protector effectiveness, or "derating", uses a variable scheme based on the type of protector. Earmuffs are expected to provide 75% of the EPA NRR in field use, resulting in a 25% derating. Slow-recovery foam plugs are assumed to offer half the NRR, with a 50% derating, and all other plugs are assumed to offer 30% of their NRR rating, resulting in an effective derating of 70%. Besides the derating of existing data, which is an interim measure, NIOSH indicates the preferable approach is to use data from the new ANSI S12.6-1997 Method B as soon as they become available from manufacturers.

The variable derating could become confusing in field use. For example, consider the scenario described in the table below, where exposure is 95 dBA TWA, requiring 10-dB real-world protection. Three different hearing protectors, each with an NRR of 24, are available in the plant. Even though each protector has the same face NRR value, only the muff and formable plug would be acceptable in this situation.

NIOSH appears to use the terms "foam" and "formable" interchangeably in most parts of the document which is an unfortunate misstatement. The research used in this area is based on expandable foam earplugs, and there is question as to the applicability of the foam plug data to other "formable" plugs like fiberglass, silicon-filled, and wax.

## Audiometry

NIOSH recommends a significant change in the definition of Standard Threshold Shift, or STS, by eliminating frequency averaging in calculation of that hearing loss

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Type of Device	Required Protection	NRR	Derating Value	Net Protection	OK?
Muff	10	24	25%	18	OK
Foam Plug	10	24	50%	12	OK
Other Plug	10	24	70%	7	NOT OK

## Changes Coming

*continued from page 3*

requiring follow-up. The new definition of STS is "15 dB twice", or a shift for the worse of 15 dB at any test frequency confirmed to be persistent by a follow-up test. In addition, NIOSH has eliminated presbycusis "correction", under the premise that adjusting hearing test results for age "masks" hearing loss until it's too late for intervention and prevention.

The new document recommends two hearing tests per year for workers exposed to 100 dBA TWA or greater, and includes 4 kHz in impairment analysis.

## Controls

While not addressing any changes in engineering control requirements other than those implicit in the change in REL, NIOSH directly addressed administrative controls. The new Criteria Document states that *"the use of administrative controls shall not result in exposing more workers to noise."*

The net effect of this clause is interesting. If we look at an example where one worker is exposed at 95-dBA TWA and three co-workers are exposed at 80-dBA TWA, administrative control could be used to comply with the current OSHA standard by employing full rotation among the jobs, thus distributing the "noise load" across more workers. Using the 3-dB exchange rate, full rotation, resulting in all 4 workers being exposed to 89-dBA TWA, would not be acceptable under the new criteria, as it would "expose more workers to noise".

## Program Effectiveness

NIOSH proposes an annual review of hearing test data as the definitive measure of hearing loss prevention program effectiveness. The presumption appears to be that an effective hearing loss prevention program will do precisely what its title indicates — absolutely prevent work-related noise-induced hearing loss in the workforce.

NIOSH's test of program effectiveness is to compare the

incidence of hearing loss in the exposed workforce to a control population. If hearing loss is occurring in the exposed group at a rate equal to or less than the control, the program is deemed effective, and vice-versa.

Barring the availability of "more appropriate data" such as hearing tests on a local, non-noise exposed population, NIOSH suggests using Annex C of ANSI S3.44-1996 as the control. There may be questions about the use of cross-sectional data like Annex C for control purposes, since it may not factor in issues of audiometric variability. The net effect for large programs will likely be the development of non-noise exposed databases for local comparison. Providing

hearing tests to all plant employees, for example, rather than following strict exposure criteria for selection for the annual hearing test could provide "more appropriate data" for local control comparison.

The new Criteria Document and discussion included in the publication provide a comprehensive analysis of current research on essential aspects of hearing loss prevention. The changes are pervasive, and touch on all aspects of hearing conservation program practice.

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## New Representatives Appointed to the CAOHC Council

Three new representatives joined the CAOHC Council at the Fall 1998 Council meeting held at the Sheraton Gateway Suites in Rosemont, Illinois on October 6, 1998.

Constance Tatman, MS RN CCM COHN-S will represent the American Association of Occupational Health Nurses. Connie is employed in Colorado.

Linda Frye, COHN-S MPH RN will also represent the American Association of Occupational Health Nurses and is employed by E.I. DuPont DeNemours & Company in Richmond, Virginia. Linda has developed occupational hearing programs for hospitals and clinics. She will be coordinating the "OHC Corner" article in this publication as well as chairing the CAOHC OHC Committee for CAOHC. *(If any of you 19,000+ OHCs have comments, questions, or article ideas for the UPDATE OHC Corner, please don't hesitate to contact Linda through the CAOHC Executive office.)*

Sara Joswiak, MPH representing the National Safety Council also joins the Council. Sara has most recently implemented hearing conservation programs in the chemical industry, including training of personnel.

CAOHC welcomes these new representatives to the Council and looks forward 1999 challenges and goals!



*From left: Sara Joswiak, Constance Tatman, and Linda Frye*

## ACOEM Approves Professional Supervisor Course for Spring '99

CAOHC has been selected by the American Occupational Health Conference Committee to present "The Role and Qualifications of the Professional Supervisor" in a full day seminar taking place on April 26, 1999 at AOHC, in New Orleans, LA.

This seminar is designed to educate occupational physicians, audiologists, and otolaryngologists regarding their responsibilities as professional supervisors for occupational hearing programs. We will continue to provide information on this course as it develops.

# Importance of Worker's Compensation Guide

Ray Gamble, MS

Medical University of South Carolina, Otolaryngology and Communicative Sciences

Noise induced hearing loss (NIHL) is a preventable disability that is typically characterized by a high-frequency sensorineural hearing loss, with a distinguishing "notch" typically seen between 3000 and 6000 Hz. The absence of such a notch, however does not mean an NIHL does not exist. It may be obscured by the effect of presbycusis or additional exposures to noise over time. [see *Noise & Hearing Loss Consensus Conference, 1990*] While the typical configuration is a symmetrical high-frequency bilateral sensorineural hearing loss, it is not unusual to see an asymmetrical configuration, particularly in patients with a history of using firearms without hearing protection.

"An important consequence of the sensitivity loss associated with NIHL is the difficulty in understanding speech. Whereas a large proportion of the energy in speech is contained within the low-frequency range, much of the information required to differentiate one speech sound from another is contained within the higher frequencies. Increased effort may be required to understand speech in these situations, which leads to fatigue, anxiety, and stress." [see *Cudworth, 1986*]

In 1959, the American Academy of Ophthalmology and Otolaryngology (AAOO-59) determined that there was a need for a prediction model to estimate the amount of hearing impairment caused by noise exposure. This formula, which was adopted by the American Medical Association in 1961, looks at the average of the thresholds obtained at 500, 1000, and 2000 Hz for each ear separately. The formula was revised in

1979 to include 3000 Hz in this average (AAO-79). If the average is less than 25 dBHL, termed the "low-fence", no hearing impairment exists. If the average is greater than 25 dBHL, a hearing impairment exists. The percentage of hearing impairment is determined in the following manner. For every decibel above the low-fence, 1.5% is weighted towards the impairment until the average reaches 100%, the "high-fence", or 92 dBHL.

"Although there appears to be no scientific basis for it, binaural impairment calculation using a 5 to 1 weighting of the better ear is commonly applied. It is clear that equal weighting is not appropriate. The total loss of hearing in one ear would

1000, and 3000 Hz is used as a basis to determine impairment.

The maximum amount awarded in South Carolina for 100% binaural hearing impairment is currently \$76,754.70. There is no waiting period to file a claim and no deduction is made for presbycusis. Thus, given the percentage of disability calculated in the above example (25.5%), the amount of the award would be \$19,572.45 (25.5% x \$76,754.70) or \$118.62 over 165 weeks, a typical schedule in South Carolina for a binaural disability. [see 14] The problem with disability formulas is that they tend to ignore the fact that individuals with the same average can have different functional

handicaps. Research studies have shown that there is a low correlation between pure-tone formulas and the amount of perceived handicap. [see *Royster, 1996*] They also ignore the debilitating effects of tinnitus.

During the validation of a workers' compensation claim for hearing loss, a

number of issues need to be resolved prior to an award. The employers best protection against such a claim is accurate and timely documentation. In the absence of a preemployment audiogram it is assumed that the employee had normal hearing when they began employment. [see *Cudworth, 1986*]

As Royster states, "Pre-employment audiograms will provide protection for the employer from unjustified compensation claims by defining the hearing status of the worker. The employer is also wise to administer termination audiograms at the end of employment for any

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Impairment Computation for South Carolina*				
	500 Hz	1000 Hz	3000 Hz	Average
Left Ear	40 dB	40 dB	40 dB	40 + 40 + 40/3=40 dB
Right Ear	50 dB	50 dB	50 dB	50 + 50 + 50/3=50 dB

Binaural disability [(5 x 40)+50]/6 = 41.7 rounded to 42 dB

42 - (low-fence of 25 dB) = 17  
17 x 1.5% = 25.5% impairment

\* SC's choice of frequencies is unusual. Most states use an average of 500, 1000, and 2000 Hz or 500, 1000, 2000 & 3000 Hz.

not cause a 50% impairment in the ability to understand speech under any condition." [see *Cudworth, 1986*]

The rules for workers' compensation of occupational NIHL varies from state to state. In some states, it is compensable, tinnitus claims are awarded, and funding for amplification is granted. However, not all states provide all of the above mentioned types of compensation. For simplicity, I will use South Carolina compensation laws as an example of an impairment calculation. Please remember to consult your own state office of Workers' Compensation to determine the impairment calculation to be used in the jurisdiction in which you reside. In South Carolina, a pure-tone average of 500,

## Workers Compensation

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individual who has ever been assigned to a noisy job or had occasional noise exposure at work." [see Royster, 1996]

The Occupational Safety and Health Administration (OSHA) states that a noise level of 90 dBA for an 8-hour time weighted exposure equals 100% of the workers daily noise dose. This is termed the criterion level by OSHA. OSHA requires hearing protection be available for employees who work in environments where the noise exposure exceeds an 8-hour time weighted average of 85 dBA. [see Clark, 1991] It is OSHA's position that any sound level below 80 dBA, called threshold, will not accumulate a daily noise dose, regardless of the amount of time the employee spends in such an environment. Hence, hearing protection is not required in such an environment. However, it is important to note that complying with OSHA standards alone will not provide protection from workers' compensation claims. "Accurate noise monitoring records (should be kept) to demonstrate that excessive noise exposure existed in sufficient degree or duration". [see Cudworth, 1986] An in-depth case history should be obtained from the claimant. OSHA fails to consider an employee's exposure to noise outside of the workplace. If the employee has hobbies such as hunting (132-139 dBA), motorcycling (80-110 dBA), or jogging with a personal stereo (95-110 dBA) and does not wear hearing protection during such activities that some percentage of their hearing loss could be due to non-occupational sources. [see Clark, 1991] The claimant should have a new audiogram done, by an ASHA certified audiologist, at least 48 hours after their last exposure to the noise source. [See LaCroix, 1989] While not every state has a waiting period before testing it is generally considered a wise move to rule out temporary threshold shifts (TTS), a recoverable decrease in hearing thresholds after an exposure to loud noises (85 dBA or greater). [see

## Noise & Hearing Loss Consensus Conference, 1990]

In essence, the physician and the audiologist need to evaluate whether the claim is justifiable. Was the noise exposure of sufficient duration and intensity to cause an NIHL? Is the claimant presenting with signs and symptoms consistent with an NIHL? Were accurate records maintained by the employer in regard to sound surveys, employee education, hearing protection availability and training? Does the employee engage in activities outside the workplace that could potentially cause the hearing loss? Once all of these questions have been addressed, then if the employee has an occupational NIHL, they should be compensated.

For a further discussion of the establishment of a hearing conservation program, readers are referred to *Hearing Conservation Programs Practical Guidelines for Success*, Royster & Royster.

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## CAOHC COURSE DIRECTOR WORKSHOP SPRING 1999

If you are interested in becoming a CAOHC Course Director and meet the qualifications as stated in the "Course Director Certification and Recertification Requirements" brochure, after approval by the application screening committee, you must also attend an 8 hour Course Director Workshop. Workshops sponsored by CAOHC are held semi-annually in the Spring and Fall of each year. Course Directors presently certified and needing to recertify via the workshop method may also attend.

The next CD Workshop will be held at the Hyatt Regency DFW Airport, Dallas, Texas on Friday, April 16, 1999. You may access further information and application forms from the CAOHC website at: <http://www.caohc.org> or by calling the CAOHC Executive office at 414/276-5338.

## 11 NEW COURSE DIRECTORS CERTIFIED

The Council certified eleven CAOHC Course Directors at the Fall, 1998 Course Director Workshop in Rosemont, Illinois on Monday, October 5, 1998 at the Sheraton Gateway Suites Hotel. Eight previously certified Course Directors completed this workshop in order to fulfill recertification requirements. The Course Director is responsible for planning and conducting training courses for OHCs and ensuring CAOHC guidelines are followed.

## CAOHC Affiliates with 1999 NHCA Conference

If you think it is time to tune up your hearing conservation skills, or if the opportunity to network with the leaders in the field, including many members of the CAOHC Council, is appealing, or if you have a hankering to learn about the latest research, best training videos, and to check out the newest audiometric and hearing conservation products, then read on ... all that and more is available and will be yours for the listening and viewing at the 1999 Conference of the National Hearing Conservation Association (NHCA). CAOHC is once again affiliating with and supporting this world-class conference which takes place February 25-27, 1999, in Atlanta

(yes, CAOHC will have a booth, so stop in and say HI!).

The conference begins with a day of workshops including a mock hearing loss litigation trial, a workshop on employee education and motivation, and a hands-on-fitting workshop which Elliott Berger will be teaching for those who want to refine their hearing protector fitting skills. Additional workshops will be offered. The following two days (Friday and Saturday) are filled with platform lectures on topics such as communication devices, educational strategies, fit testing hearing protectors, designing and maintaining an audiometric mobile van facility, and gunfire exposures, to name but a few. Poster sessions on an equally diverse set

of topics, a film theater screening the latest hearing conservation videos, manufacturer exhibits, and forums that invite discussion and controversy are also an integral part of the program. A few of the forum topics this year include fetal noise exposures, the use of age corrections in audiometry, and current challenges in hearing conservation.

Again, come see your Council members and learn the latest in hearing conservation/protection technology and research. For information and registration materials contact NHCA: 303/224-9022 (v); 303/770-1812 (fax), or visit the NHCA website at [www.hearingconservation.org](http://www.hearingconservation.org).



## In Memoriam: Aram Glorig, MD

*Jeffrey C. Morrill, MS  
U.S. HealthWorks and former CAOHC Council Chair*

Dr. Glorig, recognized as one of the world's pioneers in hearing conservation, died June 22, 1998 in San Clemente, California at the age of 92. Glorig, an expert on industrial noise and its effects on human hearing, remained active in the practice of forensic otology at the House Ear Clinic in Los Angeles until weeks before his death.

As a staunch advocate of reducing workplace noise, Glorig encouraged cooperation among health professionals, management and trade associations to protect workers' hearing. He was instrumental in the founding of the American Auditory Society, the Intersociety for Hearing Conservation (now CAOHC), the Committee on Hearing and Bioacoustics (CHABA), the Subcommittee on Noise and Hearing of the American Academy of Otolaryngology, the Callier, Hearing and Speech Center in Dallas, Texas

and the House Ear Institute's hearing research laboratory in Los Angeles.

Dr. Glorig was frequently honored for his contributions, including the presidential citation of the American Academy of Otolaryngology, the lifetime achievement award of the American Auditory Society, the health achievement in occupational medicine award from the American College of Occupational Medicine and highest honors from the National Hearing Conservation Association and the American Academy of Audiology. He also received numerous citations and awards internationally including the Amplifon award.

Dr. Glorig's career in noise and hearing conservation spanned more than 50 years and began during World War II, in England, where he studied the effects of acoustic trauma from gunfire and bomb blasts on soldiers. After the war, Glorig was appointed director of the Hearing and Speech Center at Walter Reed Army hospital in Washington. In 1947 he was asked to direct scientific surveys of noise in industry for a federal subcommittee. Much of the work conducted during these

post war years led to the development of the field of audiology.

During the 1950's, Glorig conducted studies on hearing loss and noise exposure at public events such as the Wisconsin State Fair. These early studies provided a baseline for all future researchers to compare and refer to and eventually led to the establishment of published data relative to hearing loss from aging and noise exposure. These early damage risk data provided information for industry and OSHA to establish criteria from which regulatory action levels and work related hearing loss would be determined.

Aram Glorig dedicated his career to the prevention of hearing loss and the preservation of hearing. We owe a great deal to the selfless contributions Dr. Glorig made to the field. He will be remembered fondly by those who knew him and deeply missed as a mentor and a friend.

## New ANSI Standard for Measuring Hearing Protection

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the same standard. The most exciting aspect of this new standard is that it includes a procedure, designated Method B, Subject Fit, that provides data intended to approximate the protection that can be attained by groups of informed users in workplaces with representative well-managed and well-supervised occupational hearing conservation programs. The 1997 standard also includes a Method A, Experimenter-Supervised Fit, which retains practices from the 1984 document that are designed to describe the capabilities of HPDs under ideal conditions.

The new standard was developed after years of research and a four-facility interlaboratory study. The results of the research have been recently published in the *Journal of the Acoustical Society of America* (Royster, et al., 1996; Berger, et al., 1998), with a final publication in preparation at this time. The standard specifies laboratory-based procedures for measuring, analyzing, and reporting the noise-reducing capabilities of conventional HPDs, using tests conducted on human subjects. The standard is not a method of approval of products, nor a quality assurance procedure. It simply provides noise-reduction data. However, the existence of the Method B procedure is quite valuable since leaders in the field have pointed out for over a decade that labeled Noise Reduction Ratings (NRRs) computed from existing data, as specified by the EPA, overestimate work-place protection from 6 to 25 dB, depending upon the hearing protector.

That the new standard exists is the good news. The bad news is that because there is no one home at the Environmental Protection Agency's (EPA) noise office, nothing is being done to revise the existing EPA hearing protector labeling regulation, which not only does not recognize the new standard, but still requires testing by

EPA's interpretation of a 24-year old document (ANSI S3.19-1974) that is no longer supported by ANSI. In short, the current hearing protector Noise Reduction Ratings, based upon testing to S3.19 are of even less accuracy and value than the original much-maligned EPA fuel-economy ratings. The fuel-economy ratings were improved; the hearing protector ratings have not been.

The situation is even more egregious since the professional community, led by a National Hearing Conservation Association (NHCA) Task Force on Hearing Protector Effectiveness developed consensus recommendations in 1995 calling for testing and labeling according to the new Method-B procedure (Royster, 1995), and the recently revised NIOSH Criteria for a Recommended Standard: Occupational Noise Exposure (NIOSH, 1998; also see "Changes Coming," page 3 in this issue) also specifies Method-B testing. Furthermore professional organizations such as CAOHC, and as diverse as the Acoustical Society of America (ASA), the American Speech-Language Hearing Association (ASHA), the American Academy of Otolaryngology / Head and Neck Surgery (AAO/HNS), NHCA, and others, have all written petitioning the EPA to revise the regulation. Yet nothing has happened.

To get an idea of the magnitude of the problem and to be able to implement the newer type data in your programs see *EARLog #20 - The Naked Truth About NRRs* available from E\*A\*R Hearing Protection Products. Meanwhile beware that measured as a percentage of the laboratory-rated and labeled attenuation, the field NRRs for earplugs (other than foam earplugs) yield only about 25% of the labeled values, foam provides about 40%, and earmuffs about 60%. Concern for this issue is tempered by the fact that in 90% of noisy industries daily average exposures are less than or equal to 95 dBA and virtually any well fitted, correctly and consistently worn HPD can protect the ear. The problem is that inflated NRRs of 25 to 30 dB or greater make it appear as though any HPD worn in even a slipshod manner will protect virtually any user from any noise

exposure. That is simply not the case. Thus the largest part of the problem for the practicing hearing conservationist is training, motivation, supervision, and enforcement - issues germane to all areas of personal protective equipment.

The hearing protector selection process should consist of more than merely scanning manufacturers' specification sheets and price lists. Wear test the products you intend to use, both on yourself and on small groups of employees. By developing your own firsthand knowledge and combining it with employee feedback, you not only improve the likelihood of selecting products your employees will accept, but you also will better motivate your workers by involving them in their own hearing conservation program.

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## Happy 25th Anniversary! Occupational Hearing Conservationist—Louise Johnson

Louise was educated at Indiana University and became employed by a group of private physicians specializing in occupational health. This medical group was later sold to a hospital and Louise has continued her career with this hospital clinic.

Louise attended occupational hearing conservationist training before the Council for Accreditation in Occupational Hearing began its educational & certifying endeavors. She did become CAOHC certified many years ago and most recently recertified in 1997. This OHC tells us that CAOHC has given her a sense of direction and credibility in her field, and she has looked to



Louise Johnson,  
RN BSN COHN

the support and resources of CAOHC to enhance the quality of her efforts in hearing health.

Louise has assisted in the coordination of several CAOHC approved courses for OHCs in Indiana over the years and has been instrumental in encouraging those students to become CAOHC certified. Thanks to her belief in the value of CAOHC training and certification, several hundred hearing technicians are now certified in Louise's state.

Louise's wish list for CAOHC is that it stay on the cutting edge of advances in occupational hearing conservation, and continue to inform and educate through the UPDATE newsletter.

## Course Director—Verna McHaney

Verna McHaney received her Master of Communication Disorders at the University of Oklahoma and was first employed by the University of Tennessee's Department of Otolaryngology and Maxillofacial Surgery. She was certified as a CAOHC course director in Waterville, Maine in 1973 at the first workshop held.

Verna says the biggest change she has seen in the past 25 years is a decrease of in-house hearing conservation programs, as more

services are contracted out. "It seems that the 'personal touch' by the Occupational Hearing Conservationist is lost in the testing situation as well as the training and education-- these 'personal touches' are what have made many hearing conservation programs so successful." As a CAOHC CD her personal goal is to educate the public about the deleterious effects of loud noise on hearing... eventually "putting me out of business".

In her years of experience Verna has met many people (including Millie

Sittner...a driving force in the formation of CAOHC), and relays the story of one patient who checked "yes" that he wore hearing protectors....flaps. When questioned what flaps were, with a withering look he said, "The flaps on my hunting cap, of course!"

Verna's wish to CAOHC for the future is to "Keep up the good work!" *Verna McHaney is currently employed by Mid-South Ear, Nose and Throat in Memphis, Tennessee.*

## Acoustical Considerations

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noise areas (above 85 dBA) actually improves speech recognition by lowering the overall sound level reaching a listener's ear, which reduces the potential for auditory distortion.

There are situations, however, where a particular hearing protector may attenuate high-frequencies substantially more than the low-frequencies. In these cases the residual low-frequency sounds will mask or obscure the high-frequency components, and cause the important consonant sounds to be unintelligible. Similarly, when hearing-impaired employees wear hearing protection, the higher-frequency sounds may be

attenuated to a point below the level of audibility. Therefore, too much attenuation (i.e., inadequate hearing protector selection) may be the cause of communication problems for normal-hearing as well as hearing-impaired employees.

These considerations provide support for reducing background noise levels through the implementation of engineering controls. Until such controls are in place, hearing protectors should be selected that provide adequate but not excessive attenuation. Octave-band noise data from the workplace should be used to select the appropriate hearing protector for use in a particular noise environment. The degree of protection provided may be determined by using the National Institute for Occupational Safety and

Health (NIOSH) Method 1 or "Long Method." This technique uses the measured spectral information, and is the most accurate procedure to estimate the hearing protection provided by a particular device as used in a specific noise environment. Over-protection, or similarly, wearing hearing protection in areas with sound levels below 80 dBA will interfere with speech communication and notification message intelligibility.

As indicated in a previous section, the alarm signal or speech message should be 15 to 25 dB above an individual's masked threshold. In areas with high background noise levels, this will necessitate sounding of the alarm at very high intensities. However,

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in these cases hearing protection will already be required, so that the overall sound level reaching the employee's ear should not pose a hearing hazard. Hearing protectors should continue to be worn during a broadcast of the warning signal and notification message. When the sound level of the ambient noise is greater than 110 dBA, a secondary alerting device (e.g., visual signal) should also be used.

**Requirements of ANSI S3.41**

The National Fire Alarm Code (NFPA 72) discusses the requirement for a fire alarm signal to be distinctive in sound from other signals and indicate that this sound not be used for any other purpose. Effective July 1, 1996, this required the use of the signal pattern described in ANSI S3.41-1990 "Audible Emergency Evacuation Signal." Toward the ANSI requirements, the signal shall consist of a "three-pulse" temporal pattern. Three successive "on" phases, lasting 0.5 second each, must be separated by 0.5 second of "off" time. Then, at the completion of the third "on" phase there must be 1.5 seconds of "off" time before the full cycle is repeated. Therefore, the total cycle shall last 4.0 seconds (0.5 second "on," 0.5 second "off," 0.5 second "on," 0.5 second "off", 0.5 second "on," 1.5 seconds "off"). However, this signal pattern is to be used only to notify personnel of the need to immediately evacuate the building. In many plants total evacuation is not always desirable or necessary during an emergency. The National Fire Alarm Code states that the ANSI S3.41 Audible Evacuation Signal "...shall not be used where, with the approval of the authority having jurisdiction, the planned action during a fire emergency is not evacuation, but relocation of the occupants from the affected area to a safe area within the building, or their protection in place."

**Outdoor Areas - Notification of Vehicle Occupants**

The acoustical environment of the interior of a car or truck is highly variable, depending on the type of vehicle, whether the windows are open or closed, the condition of the vehicle, weather conditions, etc. Most of these variables cannot be evaluated to the extent necessary to realistically expect that an alarm signal will be heard in all types of vehicles and in all situations. Therefore, visual signaling devices should be used to alert

all vehicle occupants that the alarm has sounded. Instructions should be given to all drivers to immediately stop the vehicle and roll down the window (or exit the vehicle) to listen for the subsequent voice notification message.

**System Testing, Maintenance, and Backup**

Requirements contained in NFPA 72, Chapter 7, should be followed for alarm system inspection, testing, and maintenance. These requirements

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### Acoustical Considerations

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should be supplemented by recommendations supplied by the equipment manufacturer and installer. When plant operating parameters change or process machinery is added or removed, the background sound levels may change. Therefore, testing and maintenance personnel should be aware that loudspeaker outputs may require adjustment from time to time.

Alarm system operation should be protected by an independent secondary or standby power supply. Additionally, a backup alarm system is necessary when the primary alarm system is temporarily out of service. This backup system must be capable of providing alarm service equivalent to the primary system, although it does not need to be

an exact duplicate in terms of mechanical and electronic equipment. If a portion of the alarm system (e.g., one floor in a building) is undergoing maintenance or has an equipment failure, the backup system may involve the use of personal radios, telephones, or employee runners to adequately notify and inform all personnel of the emergency situation.

### Chair's Message

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guidelines in technical areas such as equipment function/calibration and measurement techniques and data collection. These standards are intended to act as a guide to professionals, consumers, industries, and the general public, and are frequently endorsed or written into regulation by various regulatory agencies. ANSI standards

relating to noise and hearing conservation are administered through the Acoustical Society of America. (See Berger's article and David Byrne and Dennis Driscoll's article on page 2 for further information on how relevant ANSI standards affect our day-to-day practice of hearing conservation.)

As always, please remember that the Council and the Publications Committee is interested in your feedback regarding common questions you may encounter or topics you'd like to see covered in this newsletter. Please don't hesitate to contact me or Publications Chair Merrie Healy through the CAOHC office (address, e-mail, phone and fax information provided on page 2).

Have a safe and happy holiday season!

## Upcoming OHC Certification and Recertification Courses\*

Approved November 1998

\*The listed dates indicate day one of the scheduled classes; certification courses are 20 hours in length; recertification classes are 8 hours.

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12/2	Atlanta, GA	Wolfe, William	770/475-2055	12/11	St. Louis, MO	Levine, David	314/968-4710
12/2	Des Moines, IA	Garrett, Barbara	319/369-7569	12/14	Tampa, FL	Rhodes, Robert	713/869-6664
12/2	Kenner, LA	Seidemann, Dr. Michael	504/443-5670	12/17	Seattle, WA	Deppensmith, Kathryn	713/869-6664
12/2	Baltimore, MD	Doyle, Mary Lynette	301/776-4053	1/6	Dallas, TX	Harris, Dean	970/586-0702
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